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MEETING

STATE OF CALIFORNIA

AIR RESOURCES BOARD

JOE SERNA, JR. BUILDING

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

SIERRA HEARING ROOM, SECOND FLOOR

1001 I STREET

SACRAMENTO, CALIFORNIA

WEDNESDAY, APRIL 21, 2010

1:11 P.M.

LINDA KAY RIGEL, CSR
CERTIFIED SHORTHAND REPORTER
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1 APPEARANCES

2

3 BOARD MEMBERS

4 Ms. Mary Nichols, Chairperson

5 Dr. John R. Balmes

6 Mr. Ron Roberts

7 Dr. Daniel Sperling

8 Dr. John Telles

9

10 STAFF

11 Mr. James Goldstene, Executive Officer

12 Ms. Lori Andreoni, Board Clerk

13 Mr. David Kennedy, Staff, Program Development
Section, Office of Climate Change

14 Dr. Kevin Kennedy, Assistant Executive Officer,
15 Office of Climate Change

16 Mr. David Kennedy, Program Development Section,
Office of Climate Change
17

18 ALSO PRESENT

19 Dr. Paul Bernstein, Charles River Associates

20 Dr. David Roland-Holst, University of California,
Berkeley

21 Mr. Tom Tanton, T2 & Associates
22

23 Mr. Reid Harvey, U.S. Environmental Protection Agency

24 Professor Larry Goulder, Stanford University
25

1 APPEARANCES - continued

2 Dr. Chris Busch, Center for Resource Solutions

3 Professor Michael Hanemann, University of California,
4 Berkeley

5 Professor Hal Nelson, Claremont Graduate School

6 Dr. Hal Nelson, Claremont Graduate School

7 Mr. Jim Lazar, Burbank Water and Power

8 Mr. Norman Pedersen, Southern California Public Power
9 Authority

10 Mr. Obadiah Bartholomy, Sacramento Municipal Utility
11 District

12 Mr. Hank Ryan, Small Business California

13 Ms. Dorothy Rothrock, California Manufacturers &
14 Technology Association

15 Mr. Ray Williams, Pacific Gas & Electric

16 Mr. Hank DeCarbonel, California Concrete Pumpers

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1 P R O C E E D I N G S

2 --o0o--

3 CHAIRPERSON NICHOLS: Good afternoon, ladies
4 and gentlemen. There are plenty of seats in the front
5 for those who are standing in the back.

6 This is the Air Resources Board April 21st,
7 2010, public meeting. So I'm now officially calling us
8 to order.

9 Before we begin, we will say the Pledge of
10 Allegiance to the flag, so please rise.

11 (Thereupon the Pledge of Allegiance was
12 recited in unison.)

13 CHAIRPERSON NICHOLS: All right. Will the
14 clerk please call the roll.

15 BOARD CLERK ANDREONI: Dr. Balmes?

16 Ms. Berg?

17 Ms. D'Adamo?

18 Ms. Kennard?

19 Mayor Loveridge?

20 Mrs. Riordan?

21 Supervisor Roberts?

22 BOARD MEMBER ROBERTS: Here.

23 BOARD CLERK ANDREONI: Professor Sperling?

24 BOARD MEMBER SPERLING: Here.

25 BOARD CLERK ANDREONI: Dr. Telles?

1 BOARD MEMBER TELLES: Present.

2 BOARD CLERK ANDREONI: Supervisor Yeager?

3 Chairman Nichols?

4 CHAIRPERSON NICHOLS: Here. Thank you.

5 We have made arrangements for this program to

6 be webcast. I know at least one of our Board Members is

7 watching it in real-time, and others will be either

8 reading the transcript which is going to be available

9 from the court reporter or watching the recording of the

10 proceeding afterwards. There is great interest on

11 everyone's part in this particular topic.

12 I have a couple of announcements to make before

13 we get started that are logistical.

14 The room has emergency exits as you can see in

15 the rear and to the side here. In the event of a fire

16 alarm, we are required to evacuate this room immediately

17 and go down the stairs and out of the building until

18 there's an all-clear signal given. Then we can return

19 to the room and resume the hearing.

20 For those of you who are not regulars at ARB

21 meetings or in this building, there are restrooms on

22 this floor located down at the end of the hall.

23 And then with respect to participation in this

24 because this is a somewhat unusual set-up for an ARB

25 meeting, the way we're planning to do this is to have a

1 rather lengthy set of presentations and discussion by
2 invited panelists who are here to reflect a number of
3 different points of view and to give us information
4 about different aspects of the economic assessment of
5 the impacts of the AB 32 Scoping Plan.

6 Then there will be opportunities for those in
7 the audience who wish to ask questions or make comments
8 to participate. Rather than having everybody parade up
9 to the microphone initially, we're going to be passing
10 out cards.

11 Does anybody have cards to show what these
12 things look like? Yes. Here they are. That's a
13 comment card. We will be putting them out and passing
14 them around and then sorting them and trying to make
15 sure they're distributed to the people for whom they are
16 intended.

17 This will then be followed by further enlarged
18 panel discussion, and then finally by a general open
19 comment period where anybody who wishes to make a
20 comment of the traditional formal public comment can do
21 so.

22 We have this scheduled, this whole proceeding,
23 for four and a half hours. We also have scheduled a
24 break after the first panel so that people can get up,
25 stretch, et cetera.

1 So with that, I'd like to say just a little bit
2 more about why we're here.

3 This item is an update to the Board on the
4 revised AB 32 economic analysis. It's continued from
5 last month's Board meeting in order to allow both Board
6 Members and stakeholders more time to review the staff
7 report.

8 As you may recall, the staff report was
9 released quite soon before the -- quite close in time to
10 the last Board meeting. And rather than force people to
11 respond at that time, we decided to give additional
12 time.

13 I also want to make it clear this is not an
14 action item. It's an opportunity for Board Members to
15 hear from staff and other experts about their analysis;
16 and so we've invited a number of people to come and talk
17 about related parallel economic studies which don't
18 always reach exactly the same conclusions and to try to
19 understand the differences and the usefulness of the
20 various types of studies.

21 The ARB directed its staff to work with experts
22 as they developed their own staff analysis. And I know
23 that the ARB staff worked closely with the Economic and
24 Allocation Advisory Committee and specifically with its
25 Subcommittee on Economic Impacts during the course of

1 developing their own revised assessment.

2 We are expecting Professor Goulder who chaired
3 that committee to join us. He was teaching today and
4 was going to have to be a little bit late but he'll be
5 getting here as soon as he can.

6 This Board also directed the staff to look for
7 opportunities for collaborative modeling efforts as they
8 went about updating the analysis after the original
9 Scoping Plan was released and adopted in 2008.

10 Two of the presentations this afternoon, the
11 ones from Paul Bernstein of Charles River Associates and
12 from David Roland-Holst of UC Berkeley, are a result of
13 that collaboration.

14 They I think provide some useful insight into
15 how results can shift when you use different modeling
16 tools, although you may have the same set of inputs and
17 assumptions that you're using to exercise those models.

18 With that, and given the Board's interest, we
19 thought it would be illuminating to have a discussion
20 with all of these analysts and also to talk about
21 possible future analyses and research needs.

22 So although the principal goal here is to
23 complete our review of the most recent economic
24 assessment, we are also I think expecting to have some
25 discussion about some additional kinds of research that

1 could and should be done.

2 So I'm looking forward to a very robust
3 conversation.

4 Board Members are -- and we are joined at the
5 table here by our Executive Officer, James Goldstene.
6 We will take advantage of the opportunity to break in
7 and ask questions if we can't wait, but we will also
8 just be enjoying watching this dialogue proceeding.

9 So with that, I want to thank all of the
10 members of the advisory committee and especially those
11 on the Economic Impact Subcommittee who contributed so
12 much of their time and expertise to this endeavor.

13 I also want to thank the panelists who have
14 graciously agreed to be here today and to share their
15 results with us and to contribute to the dialogue.

16 With that, I will turn this over to Kevin
17 Kennedy, the Director of the Office of Climate Change,
18 and he will begin the introduction of the panelists the
19 pang.

20 DR. KEVIN KENNEDY: Thank you very much,
21 Chairman Nichols.

22 I would also like to add my thanks to the panel
23 members, both the ones sitting here at the table at the
24 moment with me and the panelists who will be joining us
25 when we get to the second session of the afternoon.

1 We felt that it was a very important thing to
2 do in terms of the economic analysis that we had done
3 for AB 32 to help everyone, the Board Members and the
4 public, put the work that we did into a broader context
5 in terms of what we found, what others have found, in
6 trying to analyze the economic effects of this sort of
7 action on climate change.

8 For that reason, we invited a number of people
9 for this first panel to talk about recent analysis
10 that's been done, either of AB 32 implementing the
11 Scoping Plan itself, or action that is being
12 contemplated at the federal level.

13 I will be moderating this first panel. The
14 speakers will be David Kennedy from the Office of
15 Climate Change who we heard a little bit from last
16 month.

17 Paul Bernstein from Charles River Associates
18 who we also heard a little bit from last month.

19 David Roland-Holst from UC Berkeley.

20 And as Chairman Nichols mentioned, both the
21 work that David Roland-Holst released last week and Paul
22 Bernstein's Charles River Associates work that was
23 released in March were a result of collaboration where
24 we were working to have a common set of inputs and
25 assumptions used between our analysis and other modeling

1 tools to be able to better understand the importance of
2 the different modeling tools as well as different inputs
3 and assumptions.

4 We also will have Tom Tanton from T2 &
5 Associates to talk about some analysis that he conducted
6 for the AB 32 Implementation Group.

7 And we're pleased to have Reid Harvey from the
8 US EPA who will be talking about analysis that's been
9 done of the federal proposals.

10 So that will be the first panel.

11 And what we will do from there after we take a
12 short break, the idea for those presentations will be to
13 give a fairly quick and high-level summary of what
14 analysis was done and what the results were.

15 I should also mention that one of the other
16 analyses that has been talked about a lot that has also
17 both been used by some to criticize AB 32 but also has
18 been in for its own criticism as well, was conducted by
19 Varshney and Associates.

20 We did invite Sanjay Varshney and Dennis
21 Tootelian to participate in the proceedings this
22 afternoon, but they were unable to participate. They
23 indicated they had other engagements they were not able
24 to get out of.

25 So the first panel will be presenting the basic

1 results of recent analyses.

2 We then invited a number of economists from
3 around the state to have some degree of comments on the
4 different analyses that have been conducted to be able
5 ask questions and discuss the analysis amongst
6 themselves and with the first panel.

7 And that session will be moderated by Professor
8 Larry Goulder. It will also include Hal Nelson, Michael
9 Hanemann, and Chris Bush, and we'll have a bit more
10 introduction of those panelists when we get to the
11 second panel.

12 For that panel, we did also invite the
13 Legislative Analyst Office to participate if they were
14 interested, and they, after some consideration, decided
15 they were -- they felt it was more appropriate for them
16 to listen and learn from the proceedings today rather
17 than sort of take direct part.

18 But we're very pleased to have Tiffany Roberts
19 from Legislative Analyst Office here to sort of listen
20 and learn along with us as to sort of the implications
21 of the sort of analyses that we are doing.

22 The third session after the discussion with
23 those panelists will be taking the initial comments and
24 questions that folks in the audience will have the
25 opportunity. We'll be distributing the cards shortly

1 for people to write out comments and questions to direct
2 to either set of panelists.

3 Once the second panel comes up, we'll have ten
4 people sitting around the table so questions could be
5 going to pretty much anybody or relatively broadly. So
6 there will be some additional discussion and comment
7 through that portion.

8 And then of course we will have the opportunity
9 for folks who are interested to have sort of more
10 typical public comments of getting up and speaking at
11 the microphone.

12 And we'll have a separate set of cards that
13 will be distributed for that a little bit later after
14 people have had a chance to have a flavor for the
15 discussion up to that point.

16 So with that, I would like to turn it over to
17 David Kennedy who is the main economist who was working
18 on the economic analysis, the updated economic analysis
19 of the Scoping Plan for the Air Resources Board.

20 DR. DAVID KENNEDY: Thank you, Kevin, and good
21 afternoon, Chairman Nichols, and Members of the Board.
22 I will provide a brief summary of what was presented at
23 last month's Board meeting.

24 Next slide.

25 So first of all, what was new in this updated

1 analysis. The updated ARB analysis includes a new
2 Business-as-Usual projection that reflects the recent
3 economic downturn.

4 We include as part of the Business-as-Usual
5 scenario the impacts of the Pavley 1 regulation and the
6 full implementation of a 20 percent renewable portfolio
7 standard.

8 The analysis uses a dual modeling approach that
9 includes the Energy 2020 model and the E-DRAM model.
10 The two models which have different strengths are meant
11 to act as complements and provide alternative views of
12 the potential effects of AB 32 policies.

13 The report analyzes five cases to show the
14 economic impacts of making different policy choices such
15 as getting fewer reductions from complementary measures
16 and eliminating offsets entirely.

17 Next slide.

18 ARB relied on two modeling tools to perform
19 this analysis. The first one, Energy 2020, is a
20 multisector energy analysis system that simulates the
21 supply, price, and demand for all fuels.

22 This version of the model was developed for use
23 by ARB by ICF International and Systematic Solutions,
24 Incorporated.

25 The second model was the E-DRAM model. E-DRAM

1 is a computable general equilibrium model of the
2 California economy originally developed by Peter Berck
3 in collaboration with California Department of Finance
4 and ARB.

5 Next slide.

6 The original Scoping Plan analysis estimated
7 the effects of implementing all Scoping Plan measures.
8 This analysis takes a different approach by focusing on
9 several key complementary measures.

10 These include increased energy efficiency
11 programs and standards, a 33 percent renewable energy
12 standard, increased use of combined heat and power, a
13 regional VMT target, California clean car standards,
14 goods movement measures, and the Low Carbon Fuel
15 Standard, and a Cap and Trade program.

16 Some of these measures are implemented in the
17 modeling in a detailed manner while some are implemented
18 in less detail.

19 Specifically, there are some important issues
20 that could affect the cost of the Cap and Trade program
21 that warrant further examination.

22 Next slide.

23 In this analysis, we present the results for
24 five cases that we do discuss some variations on these
25 cases in the report.

1 In the first case, Case 1, we assumed that all
2 complementary policy goals are achieved in full, and we
3 allow the use of offsets in the Cap and Trade program.

4 In Case 2, as in Case 1, all complementary
5 policy goals are achieved in full, but offsets are not
6 allowed.

7 In Case 3, there are fewer reductions from the
8 transportation measures.

9 In Case 4, there are fewer reductions from the
10 electricity and natural gas measures.

11 And in Case 5, we include a combination of Case
12 3 and Case 4.

13 So in these sensitivities, we basically assume
14 that the complementary policies achieve half of their
15 targets, with the exceptions being the 33 percent
16 renewable standard and the VMT measure where that policy
17 is excluded completely from the analysis.

18 In all cases, the Cap and Trade program
19 provides the remainder of the reductions needed to
20 achieve the AB 32 target.

21 Next slide.

22 Our assumptions about economic growth are that
23 gross state product would grow on average at about
24 2.4 percent per year or 36 percent from 2007 to 2020.

25 Personal income would also grow at a rate of

1 2.4 percent per year, and employment would grow at a
2 rate of about .1 percent per year, or 13 percent over
3 the 2007-to-2020 period.

4 Next slide.

5 In terms of economic effects, the change in
6 gross state product ranges from about positive .2 --
7 minus .2 percent to minus 1.4 percent across the five
8 cases.

9 The change in personal income ranges from
10 .1 percent to minus .6 percent.

11 Excuse me. The change in personal income
12 ranges from .1 percent to minus 1.2 percent, while
13 income per capita ranges from .1 percent to minus
14 .6 percent.

15 And the change in labor demand or employment
16 ranges from .1 percent to minus 1.7 percent.

17 And across the five cases, the 2020 allowance
18 price ranged anywhere from \$21 to \$102 in 2020.

19 Thank you very much.

20 CHAIRPERSON NICHOLS: And again, because this
21 always seems to come up, the percentages are off of a
22 projected rate of growth that would have occurred
23 regardless in 2020.

24 DR. DAVID KENNEDY: That is correct.

25 CHAIRPERSON NICHOLS: Okay.

1 DR. KEVIN KENNEDY: Thank you, David.

2 Next up is Paul Bernstein from Charles Rivers
3 Associates in order to provide an overview of their
4 analysis released in March.

5 DR. BERNSTEIN: Thank you very much for
6 inviting us here, and thank you very much for inviting
7 us in this entire process.

8 I'd also like to thank Michael Gibbs from
9 Cal/EPA for all his help as well as the ARB in this
10 collaborative effort that I will describe here.

11 Next slide.

12 Okay. As mentioned, this has been a
13 collaborative effort with the ARB, and so I'd like to
14 start out by sharing some of the common themes that we
15 found with the ARB as well as some of the differences in
16 the two modeling results.

17 First, we find that in running the set of ARB
18 scenarios, these cases that David just mentioned, cases
19 1 through 5 as well as some other cases we looked at, we
20 see a range of impacts.

21 We see the allowance prices ranging from \$50 to
22 \$80 per ton of CO2 in 2020, and this is roughly 50 cents
23 to 80 cents per gallon of gas.

24 We see the costs in terms of a per capita cost
25 ranging from \$200 to \$500, and that equates to about a

1 half a percent to 1.1 percent loss in per capita income.

2 We do find when we look at Case 5 that our
3 results are fairly similar to those of the ARB. The ARB
4 finds costs per capita of about \$270, and we find costs
5 of about \$290.

6 Also, as the ARB, we find that offsets afford
7 great benefits. They both reduce the overall costs of
8 complying with the program as well as reducing the
9 permit price associated with the Cap and Trade program.

10 We find a reduction in permit prices of about
11 33 percent whereas the ARB finds a reduction of about
12 80 percent.

13 One area where there is a fairly big difference
14 in the models is what we find about the inclusion or
15 exclusion of complementary measures when added into a
16 Cap and Trade program.

17 So we find that these complementary measures
18 restrict choices or reduce flexibility and therefore
19 increase the costs of complying with the AB 32 target,
20 whereas the ARB finds that adding in these complementary
21 measures most likely corrects some market failures and
22 therefore end up reducing costs when they're layered
23 onto a Cap and Trade program.

24 I'd like to clarify, I think, one point of
25 confusion that may be out there. Both ARB and CRA

1 account for the cost savings in any energy reductions,
2 so any energy efficiency that takes place is accounted
3 for in CRA's model.

4 And both sets of models also find that
5 sensitivity to things such as economic forecasts,
6 technology assumptions, and the like.

7 Specifically, we ran a number of sensitivities
8 where we looked at what we felt were more likely costs
9 for the alternative fuels that would be needed under the
10 Low Carbon Fuel Standard.

11 And when incorporating the costs that we feel
12 are more likely, we find that the overall program
13 costs -- that's not just the LCFS, but the overall costs
14 of complying with AB 32 -- increases by 40 percent.

15 We also find that the overall cost estimates
16 are very sensitive to the emissions forecast. So if one
17 were to use the emissions forecast that was in the 2008
18 Scoping Plan, namely IEPR 2007, as opposed to the
19 current forecast, the IEPR 2009, the costs are
20 significantly higher under the IEPR 2007 forecast.

21 Next slide.

22 Okay. So I'd like to compare results. The
23 next few slides will be fairly similar in terms of the
24 figure here.

25 So what the figure has is on the Y axis we see

1 the permit price that would result in the Cap and Trade
2 program. And on the X axis, we have the overall program
3 costs, the cumulative program costs from 2010 to 2020.

4 And throughout these slides, we'll compare
5 different scenarios.

6 The first one is showing the benefits that we
7 find of removing the complementary measures from the
8 program.

9 So the diamond to the right there labeled SP is
10 ARB's Case 1. So that's the full Scoping Plan with all
11 the complementary measures.

12 The upper square there is the Cap and Trade
13 program that achieves the same amount of emission
14 reductions as in the Scoping Plan policy but has none of
15 the complementary measures.

16 So you can see moving from the Scoping Plan
17 that includes all the complementary measures to a
18 program that has none of the complementary measures, you
19 reduce the costs by about 50 percent.

20 Now you'll notice that the carbon price
21 increases when we remove these complementary measures.

22 Essentially, what we find in our model what
23 that's saying, it's a representation of how much the
24 complementary measures are distorting the Cap and Trade
25 market.

1 So in an undistorted or unconstrained case with
2 just the Cap and Trade, the permit price would be about
3 \$30 higher.

4 And these distortions are exactly what lead to
5 this cost difference between these two policies, between
6 the Scoping Plan and then a policy that's just a pure
7 Cap and Trade.

8 Next slide.

9 BOARD MEMBER SPERLING: Could I interrupt for a
10 moment? You know, all this discussion of all this
11 aggregation kind of confuses me.

12 When you keep referring to complementary
13 measures, are you including LCF -- the Low Current Fuel
14 Standard? Are you including the VMT?

15 What are you -- what are you counting as
16 complementary measures?

17 DR. BERNSTEIN: Yes to all of that. So if --
18 on David's slide, he had -- it's the fourth slide here.
19 It's basically -- we're including -- when I'm talking
20 complementary measures, I'm including all of those.

21 So the 33 percent RES, the VMT measure, the
22 LCFS, Pavley II, the energy efficiency measures, and the
23 CHP measure.

24 BOARD MEMBER SPERLING: Okay. Well, this might
25 be kind of a methodological issue or a language issue,

1 but, you know, the VMT measures, for instance, are not
2 what you call command and control in any way whatsoever.

3 There is -- there are performance targets --
4 they're not even performance. They're targets given to
5 metropolitan areas through SB 375 is the major way
6 they're going to be met, so there is complete
7 flexibility for metropolitan areas how they meet it.

8 Likewise, with a Low Current Fuel Standard,
9 it's a -- it creates a market. They're tradable
10 credits.

11 So these -- both of these don't resemble in any
12 way whatsoever what, you know, someone might call
13 command and control and in fact, you know, have quite a
14 bit -- have a huge amount of flexibility associated with
15 it.

16 So I'm going to come back at the end, you know,
17 and ask you how you can come up with these calculations
18 when in fact these measures have a lot of flexibility in
19 them when you compare them to supposedly flexible Cap
20 and Trade.

21 Unless you have some, you know, initial
22 response to that.

23 DR. BERNSTEIN: I agree that you've built in --
24 or there are flexibility mechanisms built in to, let's
25 say, LCFS just like the RES has flexibility in it. But

1 it still constrains the market more than if you had a
2 pure Cap and Trade.

3 BOARD MEMBER SPERLING: Sure. Or if you had a
4 carbon tax.

5 DR. BERNSTEIN: Right. Either one. I mean
6 either way, it's still offering -- it's offering -- or
7 it's putting a distortion on the market compared to
8 having, as you said, a Cap and Trade or a pure carbon
9 tax.

10 This slide is showing the benefits of including
11 offsets or the -- or the losses or the additional costs
12 if you were to exclude offsets.

13 So again, the diamond is representing the Case
14 1, the Scoping Plan with all the complementary measures.

15 And the upper circle there is Case 2, which is
16 the Scoping Plan and excluding offsets.

17 The lower circle is the Scoping Plan. So
18 again, includes all the complementary measures, but now
19 we include a much larger amount of offsets.

20 So you can see that if you took from one
21 extreme of the no offsets down to more offsets, you have
22 the potential of reducing the program costs by about a
23 third and also greatly reducing the permit price which
24 would reduce or lessen the incentives for investment to
25 leave California.

1 All this is contingent also on having a
2 well-designed offset program, so under such a program
3 we'd obtain the same overall global emission reductions
4 as we would without the offsets.

5 Next slide.

6 Here we're showing the sensitivity to
7 assumptions about technologies or technological costs,
8 and this gets back to the LCFS is one of the main
9 drivers of this increase in costs here.

10 So again, the diamond is the Scoping Plan with
11 all the complementary measures.

12 The triangle is the Scoping Plan, again with
13 the complementary measures, but we're working under an
14 alternative set of cost assumptions for the low carbon
15 fuels.

16 So the Scoping Plan there is using the ARB's
17 cost assumptions which essentially assume that the
18 alternative transportation fuels are about 10 to
19 20 percent more expensive than the conventional fuels we
20 have now, the gasoline and diesel; whereas the
21 alternative measure is assuming that the cost of these
22 fuels are more around two and a half times what the
23 conventional fuels would be.

24 And under that assumption, we see that the
25 costs increase by more than 50 percent.

1 One thing that is not on this slide that we
2 have in one of our supporting slides is this gap or this
3 percentage increase shrinks a lot if you compare a
4 policy that we're just a pure Cap and Trade with the low
5 cost assumptions to a pure Cap and Trade with these
6 higher cost assumptions.

7 And that's basically because in the Cap and
8 Trade, again, you're not restricting the market in terms
9 of where it needs to get its emission reductions.

10 So when you don't do that, if you -- if higher
11 technology costs come about in one particular area, so
12 let's say the transportation sector, if you allow the
13 policy to have freedom in where it can get its emission
14 reductions, then technology increases in just that
15 sector have less of an impact on overall program costs.

16 Next slide.

17 And I'm sure I'm short on time, so why don't I
18 skip this slide. This is just a summary of the last
19 three slides.

20 Okay. Finally, let me just conclude here. I
21 would say that, instead of reading all of these, that
22 our main message is that flexibility is very important
23 in the policy.

24 We find that flexibility in terms of having
25 flexibility by removing or excluding or reducing the

1 complementary measures saves costs.

2 Flexibility in having offsets reduces costs.

3 We also say for whatever complementary measures
4 are put in place we would say that flexibility is
5 important.

6 And the last bullet has to do with any linking
7 of a federal policy. We find that if California were to
8 simply be a part of Waxman-Markey and do away -- or not
9 be under AB 32, that the cost to California would be far
10 less, and the global emission reductions would be
11 similar.

12 Thank you.

13 DR. KEVIN KENNEDY: Thank you, Paul.

14 Our next speaker is David Roland-Holst from UC
15 Berkeley who will be providing an overview of results of
16 another of the collaborative efforts that we had. And
17 his results were just published last week, so it will be
18 new to a lot of you.

19 Thank you. Go ahead, David.

20 DR. ROLAND-HOLST: Thank you, Kevin.

21 I just want to ask, is there a remote for the
22 slides? Do you have a remote? No. Okay. I'm going to
23 have to step you through some components then.

24 Thank you again, Kevin. Thanks to the Board
25 for this kind invitation, and thanks to all of you for

1 your interest in a relatively momentous policy issue for
2 California.

3 I am an independent academic, and this work is
4 being done independently.

5 Next slide, please.

6 There's an e-mail address on the first slide if
7 you have questions you'd like to address to me, but
8 without going through all the acknowledgements, I want
9 to heartily thank my colleagues at Cal/EPA for their
10 support in providing data and consultation.

11 This is an independent exercise, and it was
12 funded by nonpartisan, nonprofit NGOs which have
13 basically the same objectives as I do --

14 Next slide.

15 -- as an independent researcher. My three
16 objectives are to do this estimation as an analytical
17 exercise but to -- mainly to inform stakeholders and
18 approve visibility for policymakers and especially to
19 help to support rigorous standards for evidence-based
20 policy and policy dialogue particularly in a very
21 complex issue like this one.

22 Next slide, please.

23 This is just to summarize the overall findings
24 that my team has come up with in our parallel exercise.

25 First of all, we find that the aggregate direct

1 effects of AB 32 on the California economy are
2 negligible, more positive when they're not negligible.

3 Secondly, innovation responses could leverage
4 climate policy for a very significant growth dividend.

5 Thirdly, participation in a national climate
6 program will increase benefits for California by
7 reducing adjustment costs and providing greater growth
8 opportunities from innovation.

9 Fourth, individual sector demand output and
10 employment can change very significantly. There will be
11 significant adjustment issues that ensue from this
12 policy at the individual sector level.

13 And we also, last of all, find no significant
14 leakage in our assessment.

15 Next slide, please.

16 Here is how we do the -- maybe you should just
17 step through all these components.

18 Basically there are four pieces to the BEAR
19 model, the Berkeley Energy and Resources model, that's
20 been around since the legislative debate began on AB 32.
21 We did some early assessments; in fact, the results were
22 quoted in the Executive Order that established AB 32.

23 But this is the basic structure. I don't need
24 to go through the technicalities. The model is
25 completely documented online, and more details are

1 available to those who want to send me an e-mail.

2 The policy horizon that we are looking at now
3 is 2010 to 2020, but the model goes out to 2050 for more
4 extensive analysis.

5 Next slide, please.

6 Just maybe step through all of these. This is
7 a breakdown of all the components. It's far too prolix
8 to go through -- one more -- to go through now but
9 that's sort of the anatomy of the model facility.

10 Next slide, please.

11 One thing I want to highlight in our
12 contribution which is different from the others that
13 might be of special interest is we really do try to say
14 something about the role of innovation.

15 It is the hallmark of California's superior
16 growth experience. Knowledge-intensive industries have
17 made remarkable contributions to California's living
18 standards, and we don't want to omit this from
19 consideration in a technology-related policy such as
20 climate policy.

21 It's particularly the case with energy
22 efficiency improvements, and I have a historical study
23 that I did which is published separately showing that
24 California's electricity standards and its appliance
25 standards, its home building standards, and its

1 regulatory standards led to savings of -- actually the
2 CC estimated \$56 billion in savings, and I translated
3 that into job creation and got an estimate of about 1.4
4 million additional jobs over a 30-year period as a
5 result of energy efficiency measures.

6 To give an indication of the innovation
7 potential, we added -- we did one scenario where we
8 added a little bit to energy efficiency over the
9 assumptions of the five cases that our colleague
10 suggested to us, and the effects of that are, I think,
11 quite illuminating.

12 Next slide, please.

13 This is why energy efficiency pays off in the
14 economy. This is the California economy divided into
15 114 separate sectors, and those sectors are ordered by
16 job intensity, employment intensity.

17 As you can see, there's tremendous diversity
18 across the economy in terms of job creation potential.

19 Next step, please.

20 The basic message of this slide is that the
21 carbon fuel supply chain is among the least employment
22 intensive in the economy.

23 Next step.

24 If you look down here at carbon fuels, they are
25 the lowest in terms of job content, employment content,

1 by a long shot. I want to remind you that the vertical
2 axis, the job intensity axis, is logarithmic.

3 Next step, please.

4 And you'll see that in the service sectors and
5 the more typical consumer spending sectors, job creation
6 rates per million dollars of revenue are 20 to 50 times
7 higher than they are in the carbon fuel supply chain.

8 Next step.

9 If you can divert expenditure from carbon fuel
10 supplies, if you can save households a dollar on
11 conventional energy resources, and they redirect that
12 dollar to their more customary spending habits -- namely
13 services, right; 67 percent of GDP comes from giving
14 each other haircuts and espresso drinks, service
15 sector -- the job creation effects can be very
16 substantial. That's expenditure shifting.

17 Next step.

18 And that's basically what we see in the energy
19 efficiency scenario.

20 Next slide.

21 Evidence of this is very clear thanks to the
22 patron saint of energy efficiency, Arthur Rosenfeld,
23 who's given us this data.

24 Since 19 -- the early 1970s, California
25 departed from the national trend through efficiency

1 standards and other measures and is now 40 percent below
2 the national average, and that's where these savings
3 come from.

4 Next slide, please.

5 The effect of this on innovation I think is
6 something that we really need to emphasize because
7 assuming there will be no innovation response to climate
8 policy is, to me, shocking when you look at the capacity
9 of this economy to innovate in response to economic
10 incentives.

11 Here's the story for a very conventional
12 appliance. These are refrigerators. Standards came
13 into force somewhere during the '70s, and the effect was
14 very dramatic on energy use per unit of refrigerators.

15 The effect on capacity was negligible, but
16 actually you could say that it was positive. I won't
17 make a causal link between those.

18 But it was very dramatic improvements in
19 efficiency, and at the same time falling prices.
20 Falling prices. This is the virtuous cycle of
21 innovation that California knows very well.

22 The so-called Moore's law in semi-conductors
23 seems to apply to other standards.

24 This is refrigerator technology. This isn't
25 technology that was given to us by aliens. We invented

1 this ourselves in response to standards and policies.
2 It didn't come from nowhere. It's actually an
3 incentive-based response.

4 Next slide, please.

5 Okay. The California climate program, I've
6 talked about this, but in a national context that --
7 actually Paul spoke about it.

8 In a national setting, California is at a
9 slight disadvantage because of its past successes. The
10 marginal cost of pollution abatement is much higher in
11 California, so it's cheaper for us in a national program
12 to buy abatement elsewhere, at least part of our
13 abatement.

14 And we can save money by participating in a
15 national program. So that's the essence of that
16 finding.

17 Next, please.

18 To assess this, I actually was involved in
19 another project, and we have separate model, national
20 model, called the eagle model. We like animals in our
21 shop.

22 The eagle model is a national climate model
23 which itemizes every one of the 50 states individually.
24 And we looked at the Waxman-Markey bill for a national
25 environmental NGO, and we came to conclusions which I'll

1 talk very briefly about.

2 Next slide, please.

3 That model is fully documented if you are
4 interested in national policies.

5 Here are the scenarios, and the first five
6 scenarios have already been covered. Actually, the
7 first six have been covered. The first five are the
8 same as the ones that our colleagues at Cal/EPA have
9 done.

10 This is the same as the one that was done by
11 CRA where we assume that -- we exclude complementary
12 measures and use only Cap and Trade as the instrument to
13 achieve a climate objective.

14 Then there are two additional ones. The first
15 one adds an extra four tenths of a percent to annual
16 energy efficiency in California out to 2020. This is a
17 very modest increase.

18 The reason this number was chosen is when I
19 looked at AB 32 package, I calculated that it would
20 yield about 1.1 percent improvements on average per year
21 over the period to 2020.

22 California for 30 years has averaged a rate of
23 1.5 percent. So I simply added in the difference,
24 assuming that California could extend the 30-year trend
25 of energy efficiency improvements, particularly in

1 response to much more determined climate policy
2 measures.

3 So this is where that number of .4 percent
4 extra efficiency comes from.

5 And finally, the Waxman-Markey scenario is the
6 same as the one we did at the national level,
7 essentially reporting the results of the national
8 analysis for California.

9 Next slide, please.

10 Okay. These are our findings. And to cut to
11 the chase, our findings are very similar to those of our
12 colleagues at CARB.

13 In terms of actual magnitude, there's really
14 very little to talk about for the first five scenarios.
15 We're all in the same relative magnitudes in terms of
16 permit prices, income per capita effects, et cetera.
17 They're all quite comparable.

18 I think those differences can be what you might
19 call gentlemanly differences. That is, they don't
20 represent any fundamental disagreement between our
21 approaches.

22 There are some methodological differences in
23 the models, but they don't seem to be yielding
24 substantial differences.

25 If you look at the ARB cap, that is the cap

1 only policy, we get -- they are the largest adjustment
2 costs. We put the entire burden on the caps.

3 This would be, I think, consistent with CARB's
4 approach but inconsistent with the CRA approach because
5 the CRA approach finds there are costs to the
6 complementary measures.

7 We find the opposite.

8 Next, if we look at energy efficiency, we see
9 that energy efficiency can confer significant benefits.
10 I've already talked about the mechanism by which that
11 takes place, so I won't elaborate too much. This
12 essentially reverses cost.

13 Then finally, the Waxman-Markey approach. We
14 find smaller but not insignificant gains -- well, they
15 are maybe negligible gains. Let's be honest. But there
16 are nonnegative effects here.

17 And permit prices are prices coming out of a
18 national Cap and Trade system, but we get essentially a
19 nonnegative impact from participation in a national
20 program.

21 Next slide, please.

22 Okay. So what sources of bias might we find in
23 these results? If you don't mind I'll just summarize
24 those quickly, and maybe I'll answer questions by doing
25 that.

1 First of all, I think the assumptions regarding
2 initial conditions, especially with respect to market
3 failures are a fundamental difference between
4 approaches, and I'm very happy to elaborate on our
5 approach to this issue.

6 Secondly, no foregone damages have been
7 considered in this model, meaning that we don't look at
8 the effects of the policy or offsets, things like that,
9 on local pollution or public health effects, cost of
10 doing nothing.

11 Finally, the treatment of innovation potential.
12 As far as I know, our contribution is the only one
13 that's approaching that issue now; and yet when you look
14 at California's economic history, I think that's a
15 relatively serious omission.

16 Next please.

17 Conclusion. These are essentially a
18 restatement.

19 The macroeconomic impact of AB 32 will be
20 negligible unless California climate action triggers
21 innovation response which is a potent catalyst for
22 growth in the state.

23 By creating a market to incubate the next
24 generation of energy use and emissions control
25 technologies, California can capture national and global

1 growth opportunities.

2 Last slide, please.

3 I haven't been asked for recommendations. May
4 I cover this slide? Okay, thank you.

5 These are just kind of a synthesis of my
6 perspectives on what might be most useful going forward.

7 First of all, I think a more extensive analysis
8 of program design characteristics -- that is, the permit
9 allocation system, a rigorous, detailed, evidence-based
10 analysis.

11 Incentive properties. I think it's extremely
12 important we look more carefully at incentive properties
13 of these policies.

14 Welfare impact. We can go a long way to
15 anticipate those.

16 And multiplier effects, a more inconclusive
17 approach to understanding the benefits of these policies
18 and not so much the specific direct impact focus, but a
19 more inclusive focus.

20 Secondly, I think a more intensive analysis of
21 the market and technology responses would be very
22 welcome. And I know that technology community in
23 California is really eager to participate in that kind
24 of discussion.

25 And finally, I would personally strongly

1 recommend peer review of any research that's supporting
2 substantive policy decisions. Decisions of this
3 momentous character I think really merit a rigorous
4 review of the evidence that's used to support them.

5 Thank you very much.

6 EXECUTIVE OFFICER GOLDSTONE: I have a quick
7 question. You referred to Moore's law, and I thought it
8 might be helpful if you explained that in more detail.

9 DR. ROLAND-HOLST: Thank you.

10 EXECUTIVE OFFICER GOLDSTONE: Microprocessor
11 speed.

12 DR. ROLAND-HOLST: That's right, yeah.

13 EXECUTIVE OFFICER GOLDSTONE: You identified
14 refrigerators, but there were other examples.

15 DR. ROLAND-HOLST: That's right.

16 Well, Moore was -- he was one of the founders
17 of the Intel Corporation. And he coined essentially a
18 folkloric -- a folk rule which was that the speed of
19 processors would double every 18 months. I think -- was
20 that it? I think that -- that's it, yeah.

21 So this is just a rule of thumb about the very
22 rapid rate of innovation.

23 I think that many people in the technology
24 sector in California are hopeful that that type of
25 innovation and process, sort of learning by doing,

1 accelerating improvements, rather than the traditional
2 diminishing returns perspective, is something that will
3 apply to knowledge-intensive industries.

4 And let me remind you -- many people are not
5 aware of this, but energy by review is the world's
6 largest industry.

7 And energy efficiency can be to that industry
8 what IT is to management around the world, what biotech
9 is to medicine. It can revolutionize traditional
10 practices around the world.

11 And that's why the venture community is
12 determined -- they are so eager to put a price on
13 carbon, to create a market in the world's eighth largest
14 economy which can incubate these kind of technologies.

15 Thank you.

16 DR. KEVIN KENNEDY: Thank you, David.

17 The next speaker will be Tom Tanton from T2 &
18 Associates in order to provide an overview of some
19 analysis that he released in March.

20 Go ahead, Tom.

21 MR. TANTON: Thank you, Kevin, and thank you
22 Chair Nichols and the Board for this opportunity.

23 I've done a reconnaissance level analysis of
24 the recommended by EAAC Cap and Trade program under an
25 auction.

1 My analysis differs from those that you have
2 heard about today and last March in the sense that I
3 didn't look at the entirety of the Scoping Plan but just
4 the Cap and Trade recommendation.

5 I also didn't compare the different allocation
6 mechanisms but only looked at the cost under a
7 100 percent option.

8 I looked at four critical aspects of that Cap
9 and Trade recommendation. They are listed on the chart.

10 Next slide.

11 I basically took data and mechanisms from the
12 EAAC report of March 15th, and later in my presentation
13 I'll describe some responses to Dr. Gould's remarks at
14 the last Board meeting in March that I was unable to
15 attend.

16 Next slide.

17 The summary results are a little hard to read
18 on the screen, but they are available in the handouts.

19 The results, as would be expected, are varied
20 dependent on the auction clearing price. That's no
21 surprise to anybody, but it has implications, I think,
22 for the Board and others that I'll get into later.

23 A range of costs for a typical family of four
24 is anywhere from 270 to over \$9,300 a year depending on
25 that clearing price and the year the auction takes

1 place.

2 Since nobody can really forecast what the
3 auction prices are going to be, I assumed a range
4 basically, again, from the EAAC documented range.

5 And again, the inability to forecast that
6 market clearing price has significant impact on how the
7 CARB treats the various economic analyses.

8 We did not assume any particular price. And
9 based on the premise of uninformed prior, we assumed
10 that the price would be flat throughout the forecast
11 period. We know it won't be.

12 We also know from other markets that it's
13 likely to be highly volatile from year to year or from
14 quarter to quarter, depending upon the timing of the
15 auctions that take place.

16 There are some potential mechanisms that can
17 moderate that price volatility, but in terms of making
18 investments in new facilities in California, be it low
19 carbon fuel distribution facilities or whatever, that
20 price volatility will significantly impact the
21 investment decisions made by firms and others.

22 A few examples of the price or the cost that
23 different entities might experience. This is not just
24 energy firms. This is private and public institutions.

25 UCLA at \$20 a ton would have to pay three and a

1 half million dollars per year to stay in operation.

2 That's over a hundred freshman students.

3 It's not just low tech firms.

4 Biotech firms, one of, you know, California's
5 preeminent growth markets, would also see significant
6 cost implications.

7 And even the renewable technologies, or at
8 least some of the renewable technologies, when
9 calculated correctly, would also experience significant
10 cost increases.

11 The geothermal power plants have a significant
12 component called noncondensable gases which includes
13 carbon dioxide primarily, and unless they're in a binary
14 cycle, that's a significant cost impact to them and will
15 affect the success of the renewable electricity
16 standard.

17 Again, I did not evaluate complementary
18 measures as part of the Scoping Plan. I just looked at
19 the cost to different types of firms under the Cap and
20 Trade.

21 There's also significant uncertainty on how the
22 auction proceeds might be redistributed or reused in the
23 economy.

24 To the extent that revenue is captured in a
25 special fund under the control of CARB, the Legislature

1 would face some significant budgetary constraints. This
2 is a significant concern, primarily from the standpoint
3 that it's a bunch of money. You know, we're talking in
4 eight years of the auction collecting over 120 percent
5 of a single year's state budget in total aggregate
6 amount.

7 The EAAC did suggest some mechanisms for that
8 which may or may not be successful. It does lead, I
9 think, to an increased significance or concern about
10 leakage, not just the reuse of the revenues.

11 Consumers may in fact spend their rebate on
12 cheaper products from out of the state, so it
13 exacerbates the potential for leakage.

14 We use a very simple and, to use Kevin's
15 earlier remarks, high-level input/output model extracted
16 and collapsed from Bureau of Economic Affairs, data set
17 from 2006.

18 It does not iterate on final demand. It
19 assumes demand is comparable. And it further assumes
20 that in the region of equilibrium, whether you go
21 negative or positive, the curves are essentially
22 symmetrical and essentially the same in magnitude,
23 albeit different in sign.

24 We didn't calculate or iterate on final demand
25 because many of the models assume older elasticities.

1 And as Dr. Sperling published about two years ago with
2 his colleagues, gasoline -- a significant component of
3 all this modeling -- gasoline elasticity has dropped
4 significantly and dropped by about a factor of 10, as I
5 recall.

6 It's important to note that imports to the
7 California market from other states and other nations
8 show up significantly and represent the bulk of the drop
9 in state GDP and the overall cost in employment.

10 I do agree with Dr. Roland-Holst that service
11 sector employment would likely increase and reduce our
12 carbon intensity and add jobs; but at the same time,
13 that's more of a wealth transfer and less of a wealth
14 creation from manufacturing and high-tech.

15 We also compared our initial estimates to
16 prorated estimates --

17 Next slide, please. Thank you.

18 -- under taken by both private and public
19 entities looking at Lieberman-Warner, simply because
20 those analyses had been completed.

21 These numbers are a bit higher than they would
22 be under Waxman-Markey. Mostly analysis of
23 Waxman-Markey assumed more in the trading cost of \$20 a
24 ton where Lieberman-Warner was assumed to be about \$50 a
25 ton.

1 The proration was done simply by the fact that
2 California represents 13 percent of the national GDP, so
3 we took 13 percent of the overall cost to the national
4 economy.

5 If California goes alone, these costs would be
6 higher. Again, this right-hand column.

7 Next slide.

8 At the March portion of this event, Dr. Goulder
9 made some initial comments regarding my study and why it
10 differed from some others, and I would like to briefly
11 respond.

12 I didn't assume fuel substitutions or
13 technological change, but I didn't assume that would not
14 happen either.

15 The problem becomes whether those are
16 attributable to the Cap and Trade program. They may
17 occur naturally. And I'll give you two examples where
18 mandates and subsidies have acted counterproductive to
19 innovation.

20 The first example I'll use is Denmark, which
21 we're often told to look toward for how we should be
22 doing things. But in fact, over the last three years,
23 their labor productivity has dropped and become worse
24 than it is now -- or worse than it was then.

25 And I take labor productivity as a fundamental

1 measure of innovation. I drive a tractor on my farm
2 because I can get more work done. My labor productivity
3 on the farm is enhanced because I drive a tractor rather
4 than using a shovel.

5 I could create a lot of jobs by giving
6 everybody a shovel, but that doesn't improve the overall
7 wealth creation.

8 I also make a comment on the renewable
9 portfolio standard not just here in California but
10 elsewhere. Combined with the PTC, we've seen the price
11 of various renewables skyrocket largely as a result of
12 the demand for those pieces of equipment to become
13 overheated.

14 Wind turbines, for example, have gone from
15 about \$1,600 a kilowatt hour -- excuse me -- a kilowatt
16 installed five years ago to well over \$2200 a kilowatt
17 today.

18 That's a result of overheated demand for
19 turbines, if you can get them, driven in large part by
20 the RPS in the various states and the PTC.

21 The EAAC report also suggests a wide range of
22 uncertainty in clearing prices at auction. I think it's
23 fair to say that nobody can accurately forecast what
24 those prices are going to be ex ante.

25 In other auctions, prices have skyrocketed, but

1 they've also plummeted. Reclaimed experienced high
2 volatility. The Europe Union's market also experienced
3 high volatility. And recently the price completely fell
4 out of the market -- fell out of the bottom of the
5 market.

6 And plummeting prices lead to devaluing permits
7 that have been issued or banked. If I buy a permit
8 today for \$100, and next year when I was expecting to
9 use it it's worth \$5, the State has now created a
10 stranded asset in that permit.

11 Next slide.

12 Dr. Goulder also suggested that much of the
13 discussion in my report erroneously equates allowance
14 value with cost. I'm not sure which parts of that he's
15 referring to; but in order to determine the value, we
16 have to determine the marginal benefit from the action.

17 In the EAAC report, there's a lot of discussion
18 about the cost to California from climate change. Well,
19 that's a good discussion to have.

20 But we also need to recognize what are the
21 benefits? What change in climate trajectories will
22 occur from California's actions? And I would assert
23 that it's very little.

24 But unless we do an avoided-damage calculation,
25 we cannot establish the consumer side of that value

1 proposition.

2 We will have determined through the auction the
3 supplier side of that equation; but keep in mind, with
4 all due respect, Board, we have a monopoly market. And
5 it's a constrained monopoly market.

6 As Dr. Roland-Holst indicated, California's
7 already less carbon intensive than most other locales,
8 either in terms of carbon per GDP, GSP, carbon in terms
9 of labor, carbon in terms of capital.

10 What we should be doing is designing our
11 program to export our technology, our knowledge, our
12 techniques, and our behaviors elsewhere, not to be
13 importing goods and services from those other locales.

14 That leakage is perhaps the most significant
15 element of all of the economic analyses that have either
16 been given short shrift or ignored completely.

17 I also did not compare pre-allocation to the
18 auction approach.

19 I'm going to take the liberty here of making a
20 recommendation or suggestion.

21 There's been a lot of discussion over the last
22 two years about which economic analysis is right. We
23 have a lot of parties weighing in: Mine's right. His
24 is right. LAOs commenting on the different things.
25 Members of the Legislature are as well. It's a big

1 issue.

2 I would recommend that ARB stop the dueling
3 models. It's not of benefit. Use it as a design tool.
4 Use all of them as a design tool rather than as a quote
5 justification tool.

6 And I'll give you an example from, in my mind,
7 recent history -- for others, long ago history -- and
8 that was the run-up to the electricity deregulation.

9 At the time, I was at the California Energy
10 Commission. And one of the responsibilities of the
11 California Energy Commission is to do forecasts. So
12 they forecast the energy supply.

13 How much electricity are we going to have?
14 Well, we're going to have a surplus. Ergo, let's go
15 with a second price auction.

16 They put in place no contingencies for what
17 happens if there is not a surplus. In fact, we found
18 ourselves in that precise situation.

19 Had they in place a contingency fallback of you
20 get paid what you bid, we would have taken a \$30 billion
21 problem and turned it into a \$3 billion problem.

22 That's one example of where the analysis
23 overwhelms the rational behavior and the rational
24 decisions that you all need to make.

25 We want to export our technology and

1 manufacturing and services. We don't want to import.
2 And let's use these things, all these analyses -- you
3 can use mine or not -- but take from them design tools,
4 not justification tools.

5 CHAIRPERSON NICHOLS: I really think that is a
6 useful recommendation, and I think it will be discussed
7 further. I want to ask you to wrap up at this stage
8 just because I know we've got a lot of other people who
9 want to speak, and we're a little short Tom.

10 MR. TANTON: I was ready to wrap up, and thank
11 you for the encouragement.

12 CHAIRPERSON NICHOLS: Okay. That's great.
13 Appreciate it.

14 DR. KEVIN KENNEDY: Thank you, Tom.

15 So our next speaker and final speaker on this
16 panel is Reid Harvey from the US Environmental
17 Protection Agency, shifting the discussion from
18 evaluations of California's Scoping Plan to proposals
19 for action at the federal level.

20 Reid?

21 MR. HARVEY: Thank you, Kevin, and thank you to
22 Members of the Board for inviting me. Thank you for
23 inviting me today. I'm pleased to be here with you.

24 Just as introduction, I'm Chief of Climate
25 Economics Branch, the EPA's Climate Change Division

1 which is located within EPA's air office.

2 So in this last 12 months, EPA and other parts
3 of the administration have analyzed a wide range of
4 climate bills pending in Congress.

5 We have done at least four separate analyses in
6 the last twelve months, two for the House Energy and
7 Commerce Committee, one for the Senate Environment and
8 Public Works Committee, and most recently in January an
9 analysis of the House-passed Waxman-Markey bill for
10 Senator George Voinovich of Ohio.

11 All of these are available on EPA's website.

12 The analyses that we've done are not just EPA's
13 analyses. They represent sort of the combined work of a
14 number of federal agencies, and they represent a
15 significant amount of review by other senior economists,
16 National Economic Counsel, Counsel of Economic Advisors,
17 Office of Management and Budget, Department of Energy,
18 Department of Agriculture and others.

19 So we're doing this sort of on behalf of that
20 collective.

21 So in the ten minutes I have, I'll try to touch
22 on some of the models that we've used. I'll try to
23 discuss their limitations. I'll touch on one of the
24 results, one of the GDP results that we've come up with,
25 and then briefly compare what we've done to AB 32 while

1 acknowledging that I've not gone through in detail all
2 of the analyses that you all have done which have been
3 very impressive.

4 In summary, I think there -- my sense is there
5 are a number of commonalities between the work we've
6 done at the federal level and the work that you've done
7 here in California.

8 We've both applied several different models,
9 both sort of bottom-up, technology-rich models as well
10 as top-down economy-wide models, and that has the
11 advantage of capturing some of the technology
12 implications of these policies as well as their broader
13 effects on GDP and household incomes and so on. And so
14 that's a valuable aspect.

15 In terms of the results, I think there are also
16 some commonalities in that our analyses at the federal
17 level and here in California appear to show relatively
18 modest effects on household consumption.

19 Speaking to our results, for example, in our
20 latest analysis of the House-passed bill for Senator
21 Voinovich analyzing the Waxman-Markey bill, we looked at
22 the impacts on US consumers in terms of changes in
23 household consumption.

24 If you look at the long-term targets in the
25 Waxman-Markey bill, we found that there was a slight

1 decline in the average annual household consumption by
2 about \$74 to \$117 per year relative to a no policy case.

3 And on a percentage basis, that represents
4 about .1 to .15 percent of 2010 household consumption,
5 so relatively modest.

6 I'm going to turn to slide two now.

7 These are slides I took from an existing
8 presentation, so they weren't really meant to be used in
9 a public setting, more meant to be read, but I'll
10 briefly use this as a way to describe the two major
11 economy-wide models that we have used.

12 The first is called I-G-E-M, IGEM. It's a
13 computable general equilibrium model developed by Dale
14 Jorgenson of Harvard. It's primarily a US model. It's
15 driven by econometric data at relatively fluid capital
16 movement.

17 And it's an inter-temporally optimizing model,
18 and it looks over the whole period from 2012 to 2050 to
19 find kind of the optimal outcomes.

20 And we've also used a second model which has a
21 different style and provides some richness to our
22 analysis. This is also a CGE model. It's run for us by
23 Martin Ross out of RTI.

24 It's a global model as opposed to a domestic
25 model. It has stickier capital so it has some capital

1 adjustment costs compared to the IGEM model, and so
2 therefore you have some lag in capital changes.

3 The other thing that we've done, and I think
4 that you've done some of this as well, is applied a
5 suite of other models to try to shed some light on some
6 of the policy features of these issues.

7 So we've worked with analysts at the Department
8 of Energy using their GCAM model to look at global
9 energy and offset demand.

10 We've used a power sector model called IPM to
11 look more specifically at the renewable energy
12 standards.

13 We've used some specific models looking at
14 forest and ag sector offsets, both in the US and
15 globally using a global timber model.

16 And also looked at some of the advantages of
17 reducing non-CO2 greenhouse gases using marginal
18 abatement costs for those models.

19 Next slide.

20 This slide depicts some of the limitations.
21 I've described a few of the differences between the
22 models. I think you've done some analysis on employment
23 that we have in our models, full employment models, for
24 example.

25 So this is more, again, for you to read than

1 for me to walk through.

2 If we can go to the next slide, please.

3 In a quick look at what you've done versus what
4 we've done, I think there's a lot of similarities.

5 Some difference are we looked at nuclear power
6 and carbon capture and sequestration, and I think, as I
7 understood it, you didn't in your work.

8 We used relatively similar assumptions about
9 banking over time. I think the Congressional Budget
10 Office looked at sort of a four percent rate, and the
11 Energy Information Administration used a seven percent
12 rate. I think you're in that range. We used a five
13 percent rate.

14 The underlying policies that we analyzed were
15 obviously different with respect to offsets in
16 Waxman-Markey versus AB 32.

17 And one thing that we did that I think you
18 didn't was look in more detail about different ways of
19 allowance allocation.

20 Next slide, please.

21 So turning to results.

22 As I mentioned earlier, if you look at the
23 aggregate effects on GDP and household income, our
24 finding was that they are relatively modest over the
25 timeframe that we analyzed.

1 This is a fairly busy slide, but just to try to
2 simplify it for you, we looked at the growth of US GDP
3 in the reference cases without any climate policy.
4 That's the left-most bar as you're looking in that scale
5 over time.

6 And then using these two models, ADAGE and
7 IGEM, we looked at the effects on GDP as a result of
8 climate policy.

9 And you can see from the relative heights of
10 the bars that there's a relatively small difference.

11 And putting this another way, it would mean
12 that you would, by implementing the Waxman-Markey bill,
13 it's really equivalent to delaying reaching the same GDP
14 levels in 2030 by a range of two to five months.

15 So that's -- again, it's a change from an
16 overall growth rate.

17 Next slide, please.

18 We also used the Innovative Planning Model,
19 IPM, to look specifically at electric power issues.

20 This is a very busy slide. I'm not going to go
21 through it with you.

22 It's just to illustrate that we did look at
23 some of the complementary policies at the national level
24 to try to understand the interrelationship of the Cap
25 and Trade program and RES.

1 We found that the RES targets would be met
2 through 2015 in the no policy case, but by 2020 it
3 started to take effect in that the RES did drive more
4 renewables by 2025 than in the Cap and Trade case alone.

5 Next slide, please.

6 One thing that we didn't do in our analysis for
7 Congress was to look at the benefits of taking action on
8 climate change, but I want -- I did want -- I sort of
9 would be remiss to talk about the costs without talking
10 about the benefits.

11 So I wanted to point to some recent work that
12 was in the present annual report of the -- economic
13 report of the Council of Economic Advisors suggesting
14 there's substantial economic benefits from avoiding
15 damages from climate change, and I encourage you to look
16 at that as well.

17 And then last slide.

18 All of these analyses are available in
19 exhaustive detail on our website, and I'd be happy to
20 answer questions.

21 CHAIRPERSON NICHOLS: I guess I have a generic
22 question. Maybe it should be saved until the end. But
23 the kind of mail that I get on a regular basis, some of
24 it is polite, and some of it not so polite.

25 But here's a very, very polite one from the

1 board of supervisors of Inyo County, a rural, mostly
2 desert county in California, asking me and our Board to
3 review information related to AB 32 with a critical eye
4 because of their concerns on the effects to their small
5 county where population is small and disperse, and
6 median income is low relative to other portions of the
7 state, and to basically either reassure them that
8 everything is going to be fine or, you know, do
9 something to put a stop to this.

10 Now, there is nothing that I can tease out of
11 what I've heard from your presentation or any of the
12 other presentations that directly answers the questions
13 and concerns that these people have at the local level.

14 Although I happen to know from my own
15 experience that Inyo is a place that has some
16 opportunities for development of renewable energy, for
17 example, which would certainly be a form of jobs, I'm
18 not quite sure what else is in the Inyo County, but they
19 might have some energy-intensive mineral, for example,
20 companies that are going to be, at least short-term,
21 adversely affected.

22 What can we say to an ordinary intelligent
23 supervisor from a county like this that would help them
24 decide whether this is an issue that they should be
25 paying attention to, and if so, how?

1 I mean that's really the bottom line here.

2 MR. TANTON: Chairman Nichols, if I could make
3 a suggestion --

4 CHAIRPERSON NICHOLS: Mm-hmm.

5 MR. TANTON: -- as to the type of things I was
6 referring to earlier with respect to use the economic
7 analysis as design tools.

8 Since we know the cost, particularly on low
9 income communities, is highly dependent on the clearing
10 price within the Cap and Trade auction, why not consider
11 various price collars or price caps for those permits?

12 If we see extreme volatility, allow for forward
13 and futures market in those permits rather than having
14 to buy a permit and then bank it for a future. Buy a
15 future option on that permit.

16 So there's some techniques that can be used to
17 at least mitigate --

18 CHAIRPERSON NICHOLS: I think that's --

19 MR. TANTON: -- you know, the cost impacts.

20 CHAIRPERSON NICHOLS: I --

21 MR. TANTON: I would recommend not doing it by
22 a 100 percent auction.

23 CHAIRPERSON NICHOLS: If that was the -- that
24 would at least be a tool that one could use.

25 DR. ROLAND-HOLST: Thank you, Chair Nichols.

1 I do support the idea of experimenting or at
2 least looking at arbitrage mechanisms. I think that's a
3 good idea, and that fits into the recommendation I made
4 about more intensive analysis of these mechanisms.

5 But I would also add, although I don't want to
6 sound self-promoting, that there is a county level
7 version of BEAR on the drawing boards for each of the
8 state's 58 counties, but we're trying to find support to
9 complete that project.

10 So having said that, the state has an
11 extraordinarily diverse economy, and I think it's very
12 risky to draw conclusions from statewide averages when
13 stakeholders are really thinking about very diverse
14 adjustment challenges.

15 CHAIRPERSON NICHOLS: Thank you. Any other
16 thoughts about this? Okay.

17 Thank you.

18 DR. KEVIN KENNEDY: Any other questions from
19 the Board before we move on to the next part of the day?

20 BOARD MEMBER TELLES: I have a question.
21 Couple questions.

22 It seemed that Mr. Taton's address was a lot
23 more pessimistic than the rest of everybody else's
24 address, and it seemed to be based upon estimation of
25 uncertainty here in these analyses.

1 And was the same level of uncertainty looked at
2 in the other people who did their analyses? Or -- I
3 think there is a lot of uncertainty here and --

4 MR. TANTON: There is a tremendous amount of
5 uncertainty. And that also tells us something.

6 One is to separate the manageable from the
7 unmanageable risks or to turn one type of risk into
8 another.

9 As I just mentioned, one way to manage the
10 currently unmanageable risk of price volatility is
11 through some sort of arbitrage mechanisms.

12 I would rather that the economic analysis be
13 done using something similar to a Monte Carlo analysis
14 since they all have hundreds and hundreds of little, you
15 know, matrix boxes that have some number in them.

16 You can do sensitivity analysis based on those
17 numbers, but why not put a probability distribution in
18 it and run a Monte Carlo simulation?

19 That also tells you something very significant.
20 Is there a probability of a highly consequential fat
21 tail? Well, if so, then let's pay attention in the
22 design phase of that highly consequential fat tail.

23 But you have to complement that analysis with a
24 better analysis of the marginal benefits from California
25 reducing its emissions while everybody else continues

1 unabated or, worse, selling stuff to us at their higher
2 energy intensities.

3 So, you know, I'm a California-born native son.
4 I have to be optimistic. It's in my genes.

5 But doing the analysis, there are warning signs
6 that crop up. So they're intended as warning signs, not
7 as a pessimistic forecast.

8 BOARD MEMBER TELLES: I have one more question
9 here related to uncertainty.

10 This will probably go into the first question
11 too because to me, just being a citizen of California,
12 the biggest uncertainty here is: Will our products be
13 more expensive than the rest of the world's, especially
14 if the rest of the world doesn't play the game, if China
15 and India doesn't play the game or the rest of the
16 United States doesn't play the game?

17 It seems to me that the simple thing is that
18 California products would be a lot more less competitive
19 in the world market.

20 And in that regard, when you did these
21 analyses, did you estimate in the growth of the economy
22 what the effect would be if China and India doesn't play
23 the climate change scenario and if the United States
24 doesn't do it?

25 Because to me, it seems that if you don't put

1 that into your estimates that it would be very difficult
2 to say where the California economy is going to be.

3 You have to add three other scenarios. In
4 other words, I'm talking about China, India and the
5 United States. It seems like the California economy is
6 dependent on what happens in the rest of the world too.

7 MR. TANTON: Well, I think you're absolutely
8 correct. And China/India behavior is one element of a
9 fully robust economic analysis of what we do here in
10 California.

11 It's not just a question of whether California
12 products are higher priced. But more importantly is
13 what is the value proposition?

14 As Dr. Roland-Holst indicated, our technology
15 provides generally better performance, more convenience,
16 whatever it happens to be.

17 So the price may be higher, but if the value
18 proposition is such that others clamor for our
19 technologies, we can do with a higher price. You know.
20 Just like Nordstrom's beats out Macy's sometimes.
21 Higher price, better performance.

22 I'll give you an example from the Low Carbon
23 Fuel Standard which I have yet to see quantified in any
24 of the economic analysis.

25 The low carbon fuel has less Btus in it. So me

1 as an individual consumer, I have to fill up more
2 frequently. What is the dollar value of my lost time
3 from having to fill up more frequently?

4 That's part of the value proposition, even if
5 it's not reflected in the price.

6 The problem is that's only two examples of
7 things that need to be in the analyses which are in some
8 and not in others; but by the time you do it right, it's
9 too late.

10 There's no way to get all of the factors that
11 will have some impact. And what we're doing is we're
12 losing sight of accuracy and design guidance at the
13 expense of precision.

14 I would rather we focus on --

15 DR. KEVIN KENNEDY: Tom, I'd like to allow some
16 of the other panelists to have a chance to speak.

17 CHAIRPERSON NICHOLS: I actually was hoping
18 that the one entity that would have looked at
19 international competitiveness would be the US government
20 and --

21 MR. HARVEY: Right.

22 CHAIRPERSON NICHOLS: -- perhaps you would have
23 something.

24 MR. HARVEY: I was going to respond to that
25 portion of your question.

1 The administration did look at this question
2 about the effects of climate policy on trade exposed
3 energy intensive firms.

4 So the National Economic Counsel, the CEA, EPA,
5 the Commerce Department, the International Trade
6 Commission and others did some modeling that we
7 published in December of 2009 that looked at this
8 question, and we looked at the provisions that are in
9 the Waxman-Markey bill that address this concern.

10 We found that the allocation scheme in
11 Waxman-Markey works substantially to alleviate the
12 concerns about trade leakage from those factors. It
13 provided substantial free allocations to those firms
14 that met certain criteria with respect either to energy
15 intensity and trade exposure.

16 So I think our finding was that those sorts of
17 provisions can go a long way to addressing that concern
18 that you raised.

19 BOARD MEMBER SPERLING: I'd like to just jump
20 in for a second on this issue.

21 You know, people repeat this -- let me bring
22 it, you know, all these economic models are, you know,
23 are good and useful and this issue of trade exposure is
24 an important one.

25 I just came back from China a couple days ago.

1 It's extraordinary the investment they are making in
2 efficiency, in solar technologies and wind technologies.
3 You just see these technologies everywhere, far more
4 common than we see, even in California.

5 So, you know, it really makes me cringe, even
6 angry, when I keep hearing, you know, what's going to
7 happen to California?

8 I think, if anything, as Dr. Roland-Holst was
9 talking about, this is -- there's huge opportunities,
10 and I think that's what, you know, we all --

11 CHAIRPERSON NICHOLS: Opportunities not to
12 lose, in the competitiveness war.

13 BOARD MEMBER SPERLING: Yeah. And I would
14 support that suggestion that we look more closely at how
15 this innovation process works because, you know, we do
16 have the record in California of information technology
17 investments through Silicon Valley, the biotech, you
18 know and even some of the programs that ARB has run.

19 Like even with emission control on vehicles,
20 when you do a cost analysis and you see the effect of
21 the performance standards, there's been tremendous
22 innovation effects.

23 Just an example, we now spend more -- we spend
24 less money per car on emission control technology than
25 we did 20 years ago, even though our emissions are a

1 fraction of what they were.

2 And we haven't done a good job of that and the
3 economic models don't capture that very well. I would
4 like to kind of repeat that theme here that, you know, I
5 think that's something that either within ARB or -- and
6 maybe motivate others to look at this.

7 Because it is, you know, the -- even though all
8 the models seem to agree, that kind of scares me a
9 little, actually, these economic models that, you know,
10 in terms of the impact because I suspect on the positive
11 side there could be, you know, the positive effects
12 could be very significant, especially for California
13 which is very innovative in its technology, in its
14 industries, and its markets.

15 CHAIRPERSON NICHOLS: Don't go away folks. We
16 have more economists, more presentations, more studies.

17 (Laughter)

18 CHAIRPERSON NICHOLS: But we're going to take a
19 15-minute break. And during that break, I would like to
20 ask the staff to distribute cards to anyone who is going
21 to want to actually engage in this conversation in the
22 next hour or two.

23 And they're going to wave them around here.
24 Put down as succinctly as you can what the topic is that
25 you want to talk about.

1 Okay. We're going to take a 15-minute break.

2 (Recess)

3 CHAIRPERSON NICHOLS: Okay. We're going to
4 resume here.

5 We've now been joined by Dr. Larry Goulder from
6 Stanford who has been the tireless, tireless chair of
7 the Economic and Allocation Advisory Committee. And we
8 have also got several other people here to speak.

9 Again as a reminder, the cards that were handed
10 out and I guess will continue to be available are for
11 comments that will be organized and given to the
12 panelists. It is not for an open mic kind of session at
13 this point. That will come at the very end.

14 And we want to now introduce the second panel.
15 And this will be further discussion but more focused on
16 the review and the critique of recent economic studies
17 as well as implications for future analysis and action.

18 And so I'll turn it over to Professor Goulder.

19 PROFESSOR GOULDER: Thank you very much, Chair
20 Nichols.

21 It's a pleasure to be here. I very much
22 appreciate the fact that the Air Resources Board has put
23 together this meeting.

24 Already in the first panel, we've seen a lot of
25 ideas come out. Some of them are similar. Some

1 diverge.

2 I think the underlying question we're all
3 asking is what should we conclude about the impacts of
4 AB 32, whether it's the overall impacts or, as
5 mentioned, the impacts at the local level for a
6 particular household, particular industries.

7 So this follow-up panel, the second panel, is
8 trying to pull things together. We certainly won't be
9 able to get rid of all the uncertainty, but we hope to
10 be able to shed light on the issues, where the models
11 differ, why they differ, perhaps narrow the range of
12 uncertainties and move us closer to similar views as to
13 the impacts of AB 32.

14 So we're going to expand and consolidate,
15 hopefully, a lot of the ideas that came out in the first
16 session.

17 I mean there was discussion about the
18 complementary policies that Paul Bernstein mentioned
19 being very important in terms of explaining differences
20 in result.

21 Board Member Dan Sperling emphasized -- had
22 some views about that as well.

23 Another issue that came up this morning --
24 excuse me -- earlier this afternoon was the leakage
25 issue.

1 Board Member Telles mentioned he was concerned
2 about competition with the rest of the world, and Tom
3 Tanton as well as Reid Harvey had things to say about
4 that.

5 There's also the important issue of
6 technological change or technological innovation. David
7 Roland-Holst was especially emphatic about how
8 significant a role that could be.

9 So how do these different issues get analyzed
10 in the models? Where do the models do well? Where do
11 they not? And what can we glean from this? What's the
12 signal behind all the noise?

13 So our panelists are three. We have Chris
14 Busch, who is Policy Director of the nonprofit Center
15 for Resource Solutions.

16 Michael Hanemann immediately to my right is the
17 Chancellor's Professor as well as Professor of the
18 Department of Agricultural and Resource Economics at UC
19 Berkeley.

20 And we also have -- where is he? There he is.
21 Hal Nelson, Professor at the School of Politics and
22 Economics at Claremont Graduate University.

23 So here's the format which we're going to be
24 using. We're going to start off each panelist in I
25 guess alphabetical order will have 10 to 12 minutes to

1 comment on the first panel, the modeling work. They can
2 ask questions of the modelers if they want. Also if
3 they want they can engage in some back-and-forth
4 discussion with the modelers.

5 So that's in the first -- will take us the
6 first half hour, first 35 minutes.

7 Then I'd like to follow up with perhaps ten
8 minutes for my own comments and conduct some Q&A with
9 the panelists and the modelers.

10 And then we'd like to reserve a lot of time,
11 perhaps the last 20 minutes, to field questions and
12 engage in discussion with the Board Members, although I
13 imagine some of that 20 minutes will happen in the first
14 hour as well.

15 So we want to at least have a lot of time for
16 interaction. I think that will be most informative to
17 everyone who is here.

18 So let's start right away. I'm going to start
19 -- again, do this in alphabetical order. So Chris,
20 you're on. If you can take 10 or 12 minutes to comment
21 on the first panel and engage in discussion if you like.

22 DR. BUSCH: Thank you, Larry. I'll try to
23 provide some comparative comments.

24 And let me start by thanking you for
25 volunteering so much of your time on behalf of the

1 State. It's been incredibly useful.

2 I also think this collaborative modeling effort
3 that CARB initiated was a great idea, and I think it
4 narrowed some of the differences.

5 Let me highlight a conclusion from the EAAC
6 modeling subcommittee. And that is that, despite
7 significant differences in model assumptions, both
8 analyses -- this is referring to the CRA and the CARB
9 work. David Roland-Holst's work wasn't out at the time,
10 but I think it applies to his work as well.

11 The analyses reached conclusions that the net
12 impact of AB 32 on California is going to be very small.
13 In the absence of AB 32, the growth is forecast to be
14 2.4 percent. In the CRA results, the annual growth rate
15 is about 2.3. And for CARB, the annual growth rate is
16 the same at about 2.4 percent.

17 And let me just say why I think this makes
18 intuitive sense. We're embarking on a significant
19 endeavor, but it's really a very gradual change over a
20 ten-year time period.

21 Even though the State has done a lot, as Jim
22 McMahon, the head of energy efficiency technologies
23 division at LBNL likes to say, energy efficiency is a
24 renewable resource.

25 And CARB in their detailed policy analysis

1 outside of the macro work has found a lot of additional
2 opportunities for energy efficiency savings.

3 And then also the expenditure shifting that
4 David so eloquently described.

5 On method, let me just highlight the addition
6 of the energy 2020 model to the CARB arsenal, so to
7 speak, I think is a great addition, adding
8 technology-specific detail to the work that goes I think
9 beyond best practice.

10 For example, the work at Cal/EPA doesn't
11 integrate that sort of technology-specific detail with
12 their CGE work, and so I think that is a mark of
13 sophistication. And the CRA work, as well, also has
14 that sort of detail.

15 I think in thinking about some of the reasons
16 that the CRA work comes out with higher costs, the level
17 of detail is, in terms of sectoral disaggregation, is
18 much smaller so they have ten sectors of the economy
19 whereas in the CARB work and David Roland-Holst's work
20 there's over a hundred.

21 So by lumping things together, you basically
22 obscure opportunities for low-cost abatement.

23 On this issue of the extent of market failures,
24 I agree with things that Larry has said that there's a
25 need for more empirical work in terms of describing

1 where these market failures exist that are the basis for
2 government policies that can boost the economy.

3 And it could be that my father is a
4 psychologist, but I see a lot of irrationality out there
5 in the world.

6 I think more concretely at this time of
7 economic difficulties brought on by lack of regulation
8 an ideological position that government can't create
9 economic benefits seems difficult to maintain.

10 The EAAC included a very useful table
11 summarizing different aspects of the modeling that could
12 bias cost upwards or downwards.

13 I think some of the areas that are importantly
14 left out are the innovation areas that David mentioned,
15 and this -- basically, we're assuming current technology
16 at current costs, even though we know with emerging
17 technologies that costs will come down and that new
18 options will enter the realm of possibilities.

19 And costs come down for these emerging
20 technologies because of learning by doing and economies
21 of scale.

22 So we -- so this is not well-captured by the
23 models except for in David's innovation scenario.

24 Also, energy security is another area that is
25 of interest and is not factored in.

1 So the models basically assume a smooth price
2 path, but as we've seen, for example, in 2008 where we
3 had a spike gas prices, you know, there are these
4 unexpected events that create economic costs.

5 And of course there's the issue of the climate
6 benefits not being included.

7 And so in my view, these are studies more
8 really of costs, even though they are generally
9 interpreted as cost-benefit measures.

10 Let me say a little bit about green jobs.

11 There was a new report from the California
12 Economic Development Department showing 500,000 jobs in
13 -- green jobs in California to date, 93,000 of these in
14 manufacturing, more than any other sector.

15 So this is an increasingly well-established
16 area of work.

17 On the other hand, we have these seeds of new
18 companies, what Dan Kammen has called the billion dollar
19 companies of the future, and what the macro models are
20 not good at capturing is sort of the potential for these
21 economies to grow and dominate in the global
22 marketplace.

23 I wanted to say a little bit about some of the
24 timing issues that have been in interest in trying to
25 better understand the short-term impacts of AB 32, and

1 let me say a little bit about that, first reasons to
2 expect costs would be low.

3 There are very small reductions at the start of
4 the program. Actually, the first year cap is intended
5 to be set at Business-as-Usual taking into account other
6 policies, so not large reductions.

7 And the amount of offsets allowed is relatively
8 large compared to the amount of reductions at the
9 beginning of the program.

10 In their assessment, the LAO pointed to
11 investment requirements as a reason to expect there
12 might be job losses in the short-term. Now, I don't
13 think that's right for a couple reasons.

14 First we see innovative financing options such
15 as on bill financing, property assessed clean energy,
16 making these investments possible even with capital
17 constraints.

18 Also our current economic downturn is really
19 insufficient demand is the problem. So investment is
20 another -- could be another form of stimulus in a
21 macroeconomic sense.

22 Looking at the research needs going forward, I
23 don't think that these macroeconomic models are good for
24 optimizing the mix of effort between Cap and Trade and
25 other policies. Notice, for example, the US EPA has

1 analyzed complementary policies through other models.

2 So it would just be too expensive and
3 time-consuming to try to do that. That said, as each of
4 these regulatory measures moves forward, they're going
5 to have to be subject to a stand-alone economic
6 analysis; and in those proceedings, I would urge more
7 attention to characterizing the market failures that are
8 intended to be overcome, also push to recognize the
9 broader social benefits and costs that would ideally be
10 considered.

11 Attention is given to what is quantified and
12 monetized, and if we do not -- if we don't do that, if
13 we don't monetize these things, we're going to
14 inevitably ignore them.

15 Also going forward, we're going to need to pay
16 attention to some of the distributional questions that
17 need to be grappled with, and analysis can inform that
18 debate.

19 On Mr. Tanton's study, I didn't find it well
20 enough documented to say too much about it. I thought
21 that Larry Goulder's assessments were fair in terms of
22 not allowing for substitution away from dirtier fuels in
23 response to carbon price in terms of conflating
24 allowance value with compliance costs which sort of
25 seems to assume when you sell a permit you just throw

1 the money away, and I don't think that's what going to
2 happen.

3 Couple of concluding thoughts.

4 We have talked about costs and benefits and
5 trying to assess those. I think I would point out that
6 climate damages are what are known as a fat tail
7 distribution, and basically cost-benefit analyses sort
8 of ignore the extremes of the probability distribution.

9 And economists such as Harvard's Martin
10 Weitzman have argued that an insurance frame is really
11 the right way to think about this policy.

12 And what this research is suggesting to me is
13 that AB 32 is at worst a close to zero cost insurance
14 policy against catastrophic climate disruptions with the
15 payoff being a better world.

16 Lastly, Harvard -- former Harvard President Bok
17 put out a book recently that I would suggest should
18 inform our attention to these issues of macroeconomic
19 growth, and here's what he says. He said:

20 To oppose policies in the name of growth
21 gives economic expansion a preferred
22 position in the hierarchy of national
23 priorities that seems hard to justify
24 when doubt exists over whether it does
25 much, if anything, to promote the

1 well-being of the American people.

2 Thank you.

3 PROFESSOR GOULDER: Thank you, Chris.

4 Now we'll turn to Michael Hanemann. And again,
5 if you would like to engage the modelers during your
6 talk, you may.

7 DR. HANEMANN: I have a brief PowerPoint.

8 Let me say I greatly appreciate the opportunity
9 to attend this meeting. And as Chris stated, I think
10 the EAAC has done an extremely valuable job both in
11 general over the last two or three years but also the
12 report that just came out as an appendix.

13 My background is that throughout my career,
14 going back when I was a graduate student 40 years ago,
15 I've been a consumer of models.

16 I haven't been a builder like Larry or David
17 Roland-Holst or some of the others, but I have used
18 models like the ones here in various aspects for the US
19 and elsewhere looking at energy policy, water policy,
20 other aspects of development policy.

21 And so -- I also of course have taught
22 modeling. So I'm going to rely on some of my
23 experiences in dealing with models.

24 And also in the early years, in 2005 and 2006,
25 with my greatly missed colleague, Alex Farrell, Alex and

1 I worked with David Roland-Holst in the economic
2 modeling in the building of the BEAR model, and we were
3 certainly apprised of issues that associated with
4 modeling.

5 I want to talk --

6 Next slide.

7 -- about three topics, issues with the specific
8 models that have been talked about today, some issues
9 that arise with models generally, and then just a little
10 bit about the actual experience with Cap and Trade so
11 far.

12 Next slide.

13 In terms of the models, there are three major
14 issues that are at stake with greenhouse gas reduction
15 which determine how costly this is going to be to the
16 economy.

17 One is the extent to which you have types of
18 market failure. You have people not doing things not
19 because it would be more expensive than it's worth to do
20 the thing, but for other reasons they choose not to take
21 certain actions. And essentially they could take
22 actions and have no cost or have some gain. There is
23 the principal agent problem known to economists.

24 With some things you don't have a market
25 intermediary. I will only invest if I have a very high

1 discount rate. There are other people in the economy
2 who would make those investments with a much lower
3 discount rate, but nobody can bring me and them together
4 in such a way that there'd be gains from trade.

5 And then there's abundant evidence from
6 behavioral economics that people have limited choices,
7 people focus on certain attributes and ignore others.
8 And these are ways in which behavior can change.

9 Let me say this is just about 20 years since I
10 stopped smoking myself. And, you know, the sort of
11 analysis Charles River assumes is that I smoke because I
12 prefer that to not smoking; and if you force me to stop
13 smoking, I would be worse off because I wanted to smoke
14 because I did smoke, and therefore, there must be a
15 welfare loss because you stopped me from smoking.

16 And I know in the first month or first six
17 months, my wife will tell you there was a welfare loss.

18 (Laughter)

19 DR. HANEMANN: But the fact is, I got used to
20 it. There is no sense now in which I am worse off
21 because ten or twenty years ago you forced me -- you
22 removed something from the marketplace that I would have
23 chosen to do.

24 I mention that as an example of changes in
25 preferences. You have changes in technology, but you

1 also have changes in preferences. People see things
2 differently.

3 And there are adjustment costs. I'll come back
4 to that.

5 But you can't do an analysis from now to 2050
6 which assumes people are set in their ways just as you
7 can't do that with technology.

8 So item one is market failure.

9 Item three on my list is sort of the
10 opportunity to change preferences, how people see things
11 when you change technologies.

12 And item two is just conventional economic
13 substitution. People switch input so they switch
14 commodities as prices change.

15 The Charles River model has the price
16 substitution but rules out the other two factors.

17 Mr. Tanton's analysis rules out all three
18 factors.

19 The Air Resources Board model tries to cover
20 all three factors. It allows for two. And it tries in
21 some way -- to some degree to allow for one and for
22 three.

23 And I would actually disagree with the EAAC
24 report which says it is not possible to tell which
25 model -- which set of models comes closer to the truth.

1 I think it's clear to me that the ARB models come closer
2 to the truth.

3 What you can't say is how close and what is the
4 gap.

5 But there's no doubt that one needs to account
6 for all three models; and of the models on the table,
7 the ARB models are trying to come closest, of the ones
8 on the table.

9 Next slide.

10 It's already been mentioned, but the reason why
11 it matters tremendously if you have ten economic
12 producing sectors instead of 50 or 70 or 100 is that you
13 have gains for -- you have the potential for gains for
14 trade among the sectors.

15 If there are ten sectors, there's much less
16 potential for trading. Any one sector has only nine
17 other sectors to trade.

18 Each sector is assumed homogeneous. Each
19 sector is essentially treated as identical. And so
20 having only nine trading parties versus 99 other trading
21 parties has to bias the gains from trade down.

22 On the other hand, the Charles River model
23 allows trade between regions. But I think the degree of
24 trade, the degree of production shifting, the degree of
25 employment shifting, is actually unrealistically large

1 as a result of the way in which the model was
2 calibrated. I'll come back to that.

3 Mr. Tanton made several points that I think are
4 valuable. There is uncertainty. There is uncertainty
5 about the models themselves. There's uncertainty about
6 the inputs that go into models. And so there is a range
7 of uncertainty.

8 But I think his analysis is really off base for
9 four reasons.

10 First of all, he is using a model that doesn't
11 predict, let's say, a \$60 carbon price to analysis the
12 economic consequences of a carbon price, and there is a
13 fundamental logical inconsistency because nothing about
14 the structure of the model is consistent with the
15 economic impact that comes out of the economy that it's
16 analyzing. That's the first thing.

17 The second thing is a \$60 increase in the price
18 of carbon in 2012 is a figment of his imagination.

19 It's one thing to say there's uncertainty. He
20 could have as well analyzed a \$6,000 carbon price in
21 2012.

22 You have to have some basis for talking about a
23 \$60 price in 2012 other than that was a number suggested
24 for 2020 or 2050 and it's as good a number.

25 The third thing, and this has been alluded to

1 in the EAAC report, if somebody buys a permit for \$60,
2 somebody is receiving \$60 for selling or auctioning the
3 permit. And in Tanton's analysis, that \$60 vanishes
4 from the face of the earth.

5 And lastly, if there were a \$60 purchase of the
6 permit, and the \$60 vanished from the face of the earth,
7 Tanton's model exaggerates the impact of that because it
8 has no substitution.

9 So for these reasons I think it's significantly
10 off base. I'd like to come back to other points
11 so . . . The other general point --

12 PROFESSOR GOULDER: I'm going to alter the
13 format a bit.

14 DR. HANEMANN: All right.

15 PROFESSOR GOULDER: You'll still have the
16 floor.

17 DR. HANEMANN: Sure.

18 PROFESSOR GOULDER: But you've obviously
19 introduced some strong claims and criticisms here.

20 I would like to give the modelers a chance to
21 reply -- I think that would be most informative --
22 before it's too much history.

23 But you started with some comments that were
24 critical of the Charles River analysis model with
25 respect to complementary policy, so I was going to ask

1 Paul if you had any response to that.

2 DR. BERNSTEIN: I don't like him at all.

3 (Laughter)

4 DR. BERNSTEIN: If I can, I'd like to clarify
5 one thing that I think is actually a
6 mischaracterization, and I'm curious what you actually
7 think, Larry.

8 When we talk about this issue of having more
9 sectors or fewer sectors creating a bias, that's not
10 right, what is said here. And let me just give you a
11 simple example.

12 I would actually argue in fact that having
13 fewer sectors, we underestimate the costs.

14 Take the example where if you had two sectors
15 in the economy -- if we broke up the sectors in the
16 economy into ones that only use coal and ones that only
17 use gas. Okay?

18 Then you look at a model that aggregates those
19 sectors so they use coal and gas.

20 In the one where I am aggregated in one sector,
21 I have the substitution opportunity between coal and
22 gas.

23 In this other one where I only have coal and
24 gas because they produced totally different products,
25 that substitution possibility doesn't exist.

1 That's realistic that it doesn't exist.

2 In the CRA model actually, we aggregate various
3 sectors, various energy intensive sectors. We actually
4 have substitution opportunities that actually don't
5 exist in the real world.

6 And I don't understand the issue about these
7 gains from trade. I think that's a misstatement as
8 well.

9 Going to the issue regarding the complementary
10 measures or what have you, I think that's -- I think
11 that's a great example, actually, the smoking example.

12 I think Larry talked about his example when it
13 comes to recycling.

14 But the problem that we're faced with in this
15 analysis is we can't afford to let the consumer's choice
16 set change as we go through the analysis. If we did, we
17 could get any result we wanted.

18 Because I could take the consumer's preferences
19 today, and I'd say well, after the policy the consumer's
20 preferences are either they love this policy, or I could
21 say that they're really pissed off about this policy,
22 and I could make the costs even look far worse.

23 So I think that's just a downside. I'll just
24 let -- Larry's much more knowledgeable than I.

25 But I think that's just a shortcoming of

1 welfare economics, and we're kind of stuck with that.

2 PROFESSOR GOULDER: Okay. Thanks.

3 Before we ask Tom to respond, I just want to
4 say one thing about the complementary policies.

5 My original response was exactly like yours,
6 that the complementary policy -- the lack of -- the CRA
7 model was not giving the complementary policies enough
8 credit; therefore it biases toward upward the cost.

9 In fact, a very recently publicized appendix to
10 the economic impacts analysis has a plus sign saying
11 that the Charles River model is therefore biased upward
12 in costs because of its treatment of complementary
13 policies.

14 This morning -- or today my view has changed.
15 I think it works both ways.

16 I think that there are likely to be some
17 complementary policies that would reduce overall costs
18 of AB 32, but not necessarily all of them.

19 And as has been suggested by Tom Tanton, there
20 may be some wasteful ones as well.

21 So at this point, I think it's not clear what
22 the bias is from lack of closer attention to
23 complementary policies. I think it could go either way.

24 Do you have a comment on point?

25 DR. ROLAND-HOLST: No, I just want to join in

1 at some point. I'd like to speak about these issues.

2 PROFESSOR GOULDER: Should we finish this
3 discussion?

4 DR. KEVIN KENNEDY: Please be sure when you're
5 speaking to turn the microphone on and use it,
6 particularly for the folks on the webcast.

7 PROFESSOR GOULDER: Let's now turn the floor
8 over to Tom to respond to some of Michael's comments.

9 MR. TANTON: Thank you.

10 I think the first one I'd like to respond to is
11 the issue of substitution, technological and fuel.

12 You suggested I ruled it out. I did not rule
13 it out. I didn't rule in. I simply did not evaluate
14 that. Okay.

15 So I recognize there are -- there's likely to
16 be fuel and technological substitution, but the question
17 is whether that's allocable to the Cap and Trade program
18 that I analyzed.

19 PROFESSOR GOULDER: Specifically, you assume
20 that the expenditure by consumers or by firms on various
21 energy products and other products, that those
22 expenditures don't change, the propositions don't
23 change --

24 MR. TANTON: As a result of the Cap and Trade.

25 PROFESSOR GOULDER: So basically there's no

1 elasticity.

2 MR. TANTON: Correct.

3 PROFESSOR GOULDER: Okay.

4 MR. TANTON: I did not estimate elasticities.

5 The other is what Dr. Hanemann suggested was an
6 overreliance or emphasis on \$60 a ton. I didn't assume
7 that was any more or less likely than the range from 20
8 to 200 which I basically took from the EAAC report.

9 I didn't try to predict the auction price,
10 either in the near-term or later term, but I think the
11 results indicate that, whatever the costs are, are
12 highly sensitive to what that price clearing happens to
13 be as well as the volatility.

14 So that would be my response.

15 PROFESSOR GOULDER: Okay. I'm going to turn
16 the floor back to Michael, but I think let's do it this
17 way. We're kind of changing the rules as we go. If
18 there's an issue --

19 MR. TANTON: I would suggest that ARB keep that
20 in mind as they go forward with AB 32, that the rules
21 need to be predicated on the 3M rule -- and not
22 Minnesota Manufacturing company but measure, monitor,
23 and modify as we go forward.

24 Things are going to be different than what we
25 believe today. We're going to be smarter tomorrow than

1 we are today.

2 PROFESSOR GOULDER: Okay. So if any of the
3 panelists have a comment to make that's on the issue
4 that's currently under discussion, whether it was
5 complementary policies or, for example, degree of
6 flexibility in a model, that's fine; I think we can keep
7 things focused that way.

8 So David?

9 DR. ROLAND-HOLST: As the one who hasn't spoken
10 yet, I'll speak first.

11 Let me just say something about this 2012
12 permit price. I was told by CARB to calibrate the
13 permit price to zero in 2012 because the cap would be
14 nonbinding in the year in which it was introduced. My
15 sense is it was going to be calibrated to that.

16 That would lead to a huge bias in any results
17 that assumed a positive and significant price from the
18 outset. So yeah, I'm very concerned about that bias,
19 but there's information available on what that should be
20 calibrated.

21 Secondly let me talk about aggregation bias
22 very briefly because otherwise we're going to get bogged
23 down in a technical debate between academics. I don't
24 want to do that.

25 This is a very well established problem in

1 modeling, and aggregation bias is a significant and
2 serious issue. It can't be dismissed with simplified
3 examples. I'll give you a quick one, though, for
4 practical purposes.

5 When we did the national work for the eagle
6 model, we got significantly lower adjustment costs from
7 the national Cap and Trade because we modeled all 50
8 states, much more diverse set of economies, to accept
9 the adjustment burden, and much more sectoral detail.

10 And that's not -- it doesn't make our work
11 approach superior, but it does identify a broader
12 spectrum, so I would strongly advocate more detailed
13 assessment as a way of finding these adjustment
14 opportunities.

15 And finally, on the issue of market failures,
16 I'm really surprised that there is a still a debate
17 about the existence of market failures. We have
18 multibillion dollar financial markets that are dealing
19 with this on a daily basis.

20 Student loans. Micro credit. Look at the
21 history of energy efficiency technologies that has been
22 chronicled in California.

23 These markets -- market technologies are
24 replete with market failures. And the State can play a
25 very constructive role, but of course it has to do so

1 with care.

2 PROFESSOR GOULDER: I think there's agreement
3 that there are open market failures, as Michael has
4 indicated.

5 I think the question at hand is though whether
6 the specific complementary policies, each one of them,
7 addresses market failures in a productive way.

8 Maybe some of them do and thereby lower the
9 cost, but others may not and in fact may raise the cost.

10 DR. ROLAND-HOLST: There are no rules of thumb
11 generally that will work.

12 And also to this point that was raised earlier
13 about adding measures that introduce additional fees and
14 taxes, we are not in a first best situation.

15 There are plenty of distortions all across the
16 economy, and introducing one more or one less, there's
17 no general rule that would improve aggregate efficiency
18 or make aggregate efficiency lower.

19 PROFESSOR GOULDER: Okay, Mike. You've got a
20 few more minutes.

21 DR. HANEMANN: Thank you. Let me just say one
22 thing in response to Tom.

23 You said, Tom, you were agnostic. You said
24 that for example the way consumers allocate their income
25 among commodities could change, but you were making no

1 assumption that that was the result of Cap and Trade.

2 And it's true that they could change for other
3 reasons. People could decide to give up smoking or to
4 give up -- you know, worry about obesity and avoid fatty
5 foods. There will be other changes.

6 But if there were a \$30 or a \$60 price on
7 carbon which raised energy prices, it's taking
8 agnosticism, you know, a little too far to express
9 agnosticism as to whether that won't have any effect on
10 consumer behavior.

11 And that's the sense in which assuming no price
12 effects, I think, is both wrong and likely to bias
13 things upwards. How much upwards, what are the things
14 that will change consumption as well, of course there's
15 uncertainty.

16 But that's -- there will be price effects, and
17 particularly, you know, with higher prices.

18 MR. TANTON: I fully agree there will be price
19 effects. I also assert that there will be other
20 performance effects. That is, it's more than just
21 price.

22 DR. HANEMANN: Yeah, well, I agree with you.
23 And I'll come to that in my last slide. Wherever I was,
24 can I go back quickly.

25 (Laughter)

1 DR. HANEMANN: Yeah.

2 So I want to make just a general point. This
3 is expressed in an arcane and artless manner, but I
4 think it's important.

5 Models are calibrated to economic conditions in
6 base year, whether the base year is 2007 or something
7 else.

8 But the models are used to predict, most of the
9 time, to predict the effect of some intervention, a Cap
10 and Trade, a gas tax increase, whatever.

11 So we're actually interested not in the
12 structure of the economy in any given year, but in the
13 change resulting from a policy intervention.

14 Models are not calibrated to interventions.
15 Models are not being calibrated to whether they could
16 predict the effect of the electricity price shock in
17 2000 or, you know, the -- for that matter, the gasoline
18 price increase of three years ago. They are not
19 predicted to calibrate the effects of changes.

20 Now if the model was correctly specified and
21 correctly estimated, it wouldn't matter because you
22 could calibrate the model to one thing and predict to
23 another thing if everything is correct.

24 But we don't know if it's correct, and the fact
25 is it might not be.

1 And the habit of not calibrating models to the
2 type of interventions we're trying to predict lends an
3 air of unreality to the models. Let me go on --

4 CHAIRPERSON NICHOLS: This is so reassuring.

5 (Laughter)

6 DR. HANEMANN: It is one of the secrets of
7 model building.

8 And therefore one of the questions one needs to
9 ask is -- see the models are calibrated, say, to 2009,
10 and then we project out to the future.

11 Long ago, Henri Theil built a model in 1965 and
12 projected the past. The one advantage -- so the past
13 won't be the same as the future. But the one advantage
14 is you know the past, and you can see how good a job the
15 model does of predicting things backwards.

16 In particular, you know, past intervention, you
17 could start the model in 1955, look at an intervention,
18 and then you could see what the model would say going
19 ten years forward, and you could see what happened.

20 And as a concrete example, you know, can a
21 model predict the Rosenfeld effect? Can a model predict
22 what happened to refrigerator prices?

23 Or would the model think that refrigerators
24 would become much more expensive, there'd be a reduction
25 in the quality or the use of refrigerators and so on?

1 That's the point I want to make.

2 Some effort -- and I know from the work by the
3 Energy Commission in 2005, some effort has gone into
4 this with the ARB models. Not a lot of effort, and I
5 think that needs much more effort in the future, but
6 that's one of the criteria we should use.

7 Next please.

8 CHAIRPERSON NICHOLS: Could I just stop you for
9 a second, because this is something where I feel like
10 maybe I do know something, so I want to check it.

11 I have some experience with air quality
12 modeling. In the world of air quality monitoring,
13 that's exactly how you test whether a model is the one
14 you want to use or not.

15 You look at whether it's capable of predicting
16 past episodes based on things that you know that you
17 did.

18 So is what you're saying to me that we either
19 haven't done that or couldn't -- or somehow couldn't do
20 it with respect to the models that we're now using?

21 DR. HANEMANN: So there are complications, of
22 course, because if you start in 1955 and you project,
23 other things may have been going on after 1955 which you
24 can't control for.

25 So it's not easy, and it's not -- and you can't

1 do it perfectly.

2 But I think there should be more effort to
3 doing that. And particularly when today's -- some of
4 today's models actually existed in versions in 1990 or
5 1995. But there should be some concerted effort.

6 So what I would say is it's not easy, but for
7 the most part there's no attempt to do that and -- or
8 very little, and that's something that I would
9 encourage.

10 CHAIRPERSON NICHOLS: I would think so.

11 DR. HANEMANN: Yes.

12 Well, so one -- a crucial -- the models are
13 equilibrium models. And what happens is even if we're
14 in equilibrium now, we're changing to a new state and
15 there's a path of adjustment.

16 And how quickly the adjustment occurs and how
17 costly it is, what the adjustment cost is not included
18 in the models.

19 And again, that's something where it's
20 difficult, but there should be an effort to try and
21 incorporate those facts.

22 And a particular chunk of this is associated
23 with capital being turned over.

24 And so the equilibrium might be to retrofit all
25 the widgets with this, but maybe only 30 percent will

1 get retrofitted in any one year so it will take three or
2 four years.

3 Next slide, please.

4 I think I've just got two major points.

5 With regard to benefits, it's been noted that
6 the models don't deal with the benefits, whether they're
7 greenhouse gas benefits.

8 The last bullet here is something that is not
9 widely understood in the modeling. Technically, it's
10 been assumed that whatever is the water quality or air
11 quality or temperature or drought or whatever doesn't
12 affect the market economy very much, so the
13 environmental impacts are assumed to be separable from
14 the market ones and can be ignored.

15 My friend and colleague Harry Smith has a
16 couple of papers showing that actually that's not true,
17 and that even if you didn't care about the environmental
18 benefits, but these things disrupt the labor supply,
19 they change what market commodities people want to
20 purchase, and those things have economic consequences,
21 and so all the more reason to bring in the
22 environment -- sort of the environment alongside the
23 market economy.

24 Next slide.

25 This gets at what Tom said. I've spent quite a

1 bit of time over the last two years looking at the
2 actual experience with emission markets in the US, for
3 SO₂, for NO_X, for lead.

4 And I concluded that much of the change was not
5 triggered by prices, but I think it was triggered by the
6 caps placed on individual firms which seized the
7 attention of senior management, made these issues
8 salient, and led them to change things.

9 So I would agree with Tom that in fact the
10 empirical evidence is that there were no price changes
11 to speak of outside the sector that was regulated.

12 All of the action was that the sector that was
13 regulated paid attention to the issue, found new
14 production technologies or new ways of doing things
15 which got rid of the problem at a minor cost.

16 Next slide. And this is my last one.

17 So just because that worked in the past, just
18 because it worked for SO₂, absolutely doesn't mean it
19 will work equally well. Greenhouse gases are much more
20 complicated, and the future is perhaps more complicated.

21 But it does mean that there's more in the
22 world -- there's more in heaven and earth than the
23 models allow for. There's an incentive with the price
24 of regulation to figure out some way of dealing with the
25 problem, and that leads you some of the time to

1 solutions that are not in the existing model.

2 And I think this is an area, the calibration of
3 the past and trying to be sort of realistic to the
4 future, this is something which I think the ARB staff
5 should pay attention to.

6 But it would need the staff and the resources
7 because what it's done right now I think has been
8 exemplary, but that's been a lot of effort, and we're
9 recommending additional effort to be loaded on.

10 Thank you.

11 PROFESSOR GOULDER: Thank you, Michael.

12 I just want to amplify one point that you made.
13 I know we were all rushed, but you mentioned this issue
14 of salience.

15 Your recent research suggests that since
16 salience is important, it makes a difference whether you
17 introduce a cap and trade system upstream or downstream
18 because that's going to indicate where the salience
19 occurs.

20 Economists tend to have this view that it
21 doesn't matter, that the overall impacts on various
22 firms are the same irrespective of whether it's up or
23 down. So that's, I think, an important issue.

24 DR. HANEMANN: And we're referring to some work
25 by your student, Ken Gillingham, which has shown that

1 which I think is a terrific study.

2 EXECUTIVE OFFICER GOLDSTONE: Dr. Goulder,
3 could I ask a quick question? And Dr. Hanemann.

4 On slide A, you recognize the fact that we are
5 not -- we haven't or maybe it's not possible to model
6 the climate and environmental impacts alongside the
7 other modeling we're doing.

8 Is there a way to go about doing this that
9 you'd suggest we should look at?

10 DR. HANEMANN: I would say yes, but you sort of
11 build up, branch on it.

12 But one can -- there's issues of resources.
13 There's issues of data. And there's issues of
14 implementation, including calibration.

15 Kerry Smith's recent work with his former pole
16 star Carbone shows a technical way of doing the
17 calibration. And the calibration becomes more
18 complicated it turns out when you have -- than
19 conventional calibration.

20 So the answer is I think this is practical, but
21 it will take time. And you sort of want to start slow,
22 but I think you want to set this as a goal.

23 And given all the work on impacts and the other
24 work that the Air Board does with regard to air
25 pollution effects, you more than any other agency sort

1 of have the data in hand. So I think that would be an
2 appropriate path to start going down.

3 PROFESSOR GOULDER: There's a growing industry
4 of so-called integrated assessment models which try to
5 build together both the environment and the economy. I
6 know the EPA has some models of that sort.

7 But as Michael indicates, you know, the more
8 the scope of the model, the more difficult it is in
9 terms of data and calibration.

10 So Hal, you're on.

11 DR. NELSON: Great, thank you.

12 I'd like to extend my thanks to the Members of
13 the Board and Larry and staff for getting me up here
14 from southern California. I think I'm the only SoCal
15 representative.

16 My only complaint I guess, and it's a small
17 one, is that I have to follow Michael, and I'm not sure
18 that my SoCal surf dude accent is much of a selling
19 point, but I'll do my best.

20 As the slide indicates, I'm a research
21 professor at Claremont Graduate University. My research
22 is on energy policy and policy evaluation.

23 And for the last -- is that feedback coming
24 from me? I have enough ringing in my ears. I don't
25 need any more.

1 CHAIRPERSON NICHOLS: Usually it means we need
2 to move all of our Blackberries and similar equipment
3 away from the microphone. They seem to not like that.

4 DR. NELSON: Okay.

5 For the last several years, I've been working
6 for the Center For Climate Strategies.

7 Next slide and -- or slide, period.

8 (Laughter)

9 DR. NELSON: And the Center is a nonprofit that
10 works with state governments to develop climate action
11 plans. And we've done these in over 16 states across
12 the US.

13 And these climate action plans are unique in
14 the sense that they are developed by stakeholders from,
15 you know, all sectors of the economy and all
16 professions.

17 I recently did an analysis of the stakeholders
18 and the impacts of the stakeholders on the outcomes. It
19 turns out that the energy sector is the largest
20 representative of the stakeholders.

21 So this isn't a bunch of environmentalists
22 sitting around thinking how are we going to save the
23 planet, but industry folks looking at what can we do,
24 you know. What is desirable and achievable for these
25 states to do to reduce their greenhouse gases?

1 Next slide.

2 So what I'm going to talk about here today
3 briefly is some of the macroeconomic results that we
4 have gotten from -- we've done four macro studies. You
5 can see which states they are up there.

6 Adam Rose has been -- and Dan Wei at the
7 University of Southern California, have been primary
8 suspects in all these reports.

9 My role has been as the liaison with the energy
10 sector. I'm more of an energy guy and less a macro guy,
11 so I'm not going to be able to comment on a lot of the
12 aggregation bias and whatnot except from how it affects
13 my work and how we operationalize our results.

14 So these Climate Action Plans are similar to
15 California's in a lot of ways. We have what you would
16 call complementary policies.

17 We also have what you would call offsets in the
18 ag, forestry, and waste sector. These are economy-wide
19 plans. And it's a mix of policies as you can tell,
20 price mechanisms and codes and standards.

21 Next slide.

22 So here's an example of a cost curve from the
23 state of Michigan. This is one we did. The Climate
24 Action Plan was in '08, and then we did the
25 macroanalysis end of last year.

1 As you can see here, this is your classic kind
2 of upward sloping supply curve where you've got price on
3 the Y axis, and on the X axis -- I don't know if you can
4 read that or not from where you're at. I don't think
5 you have a copy of this presentation, members of the
6 audience, but.

7 So this is a percentage reduction of the 2025
8 Business-as-Usual greenhouse gas emissions.

9 So you can see there that -- if you look
10 basically underneath the 0 axis and you look out to the
11 right, you can see that about a little over 25 percent
12 of the state's -- Michigan in this case -- greenhouse
13 gas emissions can be mitigated at negative cost.

14 That's net economic benefit to the state.

15 Then the supply curve on the other side of that
16 axis gets a little steeper.

17 But nonetheless, you can see, you know, at
18 around \$50 a ton you can mitigate about 40 percent of
19 the state's estimated greenhouse gases.

20 The other thing I should point out here -- I
21 don't know if you can see the colors, but probably the
22 color that's easiest to see is the orange, and that's
23 what you consider demand side management. We call it
24 residential, commercial, and industrial. Those policy
25 options constitute the bulk of at least the negative

1 costs of supply for the state.

2 So what do we do with this data? Well, we have
3 essentially cost data for every year for every one of
4 these options, we call them policy options. Some states
5 there's 50 or more of these.

6 And we then plug those into what's called the
7 REMI model, which is a really commonly used model for
8 evaluating policies. State governments love it. It's
9 unfortunately quite expensive.

10 And there's a description of the model there,
11 but it's been around for a long time, and it's pretty
12 widely accepted for this type of policy analysis.

13 And importantly, it has very detailed
14 representations. It has 169 sectors. I'm going to come
15 back to that, and the importance of that in my work, in
16 a minute.

17 So slide six is kind of the money slide for
18 folks, trying to keep your attention here before I get
19 into the weeds on some modeling stuff, and then I'll
20 probably lose you, mentally if not physically.

21 But you can see here the different states, and
22 the date of the reports, these are all relatively
23 recent. The target year. The percent reduction in --
24 from the Climate Action Plan. And then the macro
25 impacts.

1 So I call it GDP. Other people call it GSP. I
2 don't know what the Bureau of Economic Analysis is
3 calling it this year, but -- so you can see in Michigan
4 a positive 2.3 percent gain in GDP and a 2.7 percent
5 estimated employment gain.

6 Now this -- remember, Pennsylvania is a big
7 coal mining state. So what we're doing in Pennsylvania
8 by reducing -- you know, you saw a lot of the supply of
9 greenhouse gases come from essentially demand side, so
10 you're displacing a lot of coal miners.

11 And I worked in Pennsylvania with the energy
12 supply group, and that came up in basically every
13 meeting: What happens to our coal miners?

14 Well, it turns out that you substitute your
15 coal miners for energy efficiency equipment installers,
16 evaluation, monitoring evaluation, and other
17 essentially -- I don't know if you call them white
18 collar, but blue-white -- maybe a light blue collar
19 worker.

20 This is a pretty diverse group. So Florida, I
21 think, would have a similar kind of economic structure
22 to California. You can see positive gains there as
23 well.

24 Pennsylvania and Wisconsin -- I'm sorry,
25 Michigan; I misspoke. Michigan, they have not such big

1 coal mining. Pennsylvania has big coal mining. You
2 still see modest employment gains there as well.

3 And then Wisconsin, and I compared California
4 here as well.

5 So granted, this is what we call a small end
6 study, a small sample. But you can see that our results
7 anyway indicate that these climate action plans have
8 positive effects on economic performance.

9 And, you know, you can argue about whether
10 negative half percent or positive half percent is noise,
11 but I think when you are framing this and you're
12 pitching this policy to the public, if you can say that
13 these are likely to lead to good outcomes rather than
14 not bad outcomes, it has -- it's a much more powerful
15 talking point, right? And I know Chairman Nichols was
16 looking for talking points.

17 And Inyo is kind of a unique place, so we
18 discussed before there's a lot of diversity in the
19 counties of California, so this is -- obviously, you
20 know, you can't make generalizations across the economy,
21 but if you look at the kind of supply curve and the
22 types of activities that would be happening, you know,
23 you could see there were certainly sectors in Inyo that
24 would benefit.

25 The other thing I didn't present here, we also

1 simulate the economic outcomes for each of the policy
2 options. So we run these individually, and then we run
3 them simultaneously.

4 And so that -- it's kind of interesting from a
5 policy design standpoint. You can see, you know,
6 basically which -- where the big hits to employment or
7 the losses are from which policy.

8 You know, typically renewable portfolio
9 standards, no surprise, tend to have, you know, job loss
10 associated with them because of the negative prices on
11 electricity, pricing effects on electricity.

12 Let's go to the next slide.

13 So at this point, I'm going to kind of shift to
14 quickly my evaluation of the California approach. And,
15 you know, bottom line, it's very similar to what we do.

16 The Energy 2020 model is bigger and sexier and
17 more expensive than what we do which is desktop
18 modeling, but I think that it's probably the best way to
19 go about modeling climate policies, and I'll tell you
20 why.

21 First of all, it's more representative of the
22 real world. So you have the very detailed outputs from
23 the energy model, and you can plug those into a highly
24 detailed macro model, or CGE model in this case.

25 It's also -- talk a little bit about this, you

1 know, it's important when you plug these into the macro
2 models as to what's in state versus out of state, right?
3 The more detail that you can get in the model, the more
4 information you're going to have about the specific
5 employment gains that occur in the state, whether it's
6 for HVAC installers or for wind turbine manufacturers
7 and installers versus what happens in Nevada versus what
8 happens in Michigan.

9 And I think it's also important -- I'll talk a
10 little bit about this in my last slide -- that we move
11 beyond this market failure debate.

12 I mean I've worked in Iowa. The Public Utility
13 Commission in Iowa is considering a one and a half
14 percent new energy efficiency mandate in the state, new,
15 you know, every year.

16 New York is doing the same thing.

17 So, you know, regulators recognize that these
18 are cost effective sources of new supply. They're the ones
19 paying the bills. I think that -- and we have
20 sophisticated methodologies for monitoring free-riding
21 and spillover.

22 So I guess, you know, to kind of summarize, I
23 don't think of these as complementary policies,
24 especially demand side management. I think of these as
25 core policies.

1 And rather than frame these as complementary
2 policies, probably betraying my background as a
3 recovering finance professional, but to think about
4 these as a portfolio of approach, of options, right?
5 Each with their own risk-reward parameters.

6 And as you expand the -- as you diversify your
7 portfolio, you're essentially increasing your efficient
8 frontier, right? And you're capturing alpha, right?
9 You're capturing value, as Tom would call it.

10 So I think a portfolio approach is a better way
11 of thinking about these.

12 So in terms -- I'll kind of skip over some of
13 this. It maybe gets a little bit too far into the
14 weeds, and I'm running out of time.

15 But, you know, my reading of the methodology is
16 that the Energy 2020 model and the way that it's set up
17 is potentially overstating the costs, and that could
18 partially explain the discrepancy between what we found
19 in other states what the ARB has found.

20 It has to do with the way the Energy 2020 model
21 essentially switches, and its switching function. And
22 Dave and I have talked a little bit about this.

23 And the other element of the model -- and maybe
24 David could correct me if I'm wrong here -- is looking
25 at the appendix of the model, there really isn't any

1 endogenous improvement in device or process efficiency
2 in the model.

3 So by what you're saying where -- in these
4 scenarios 2 through 5, while we're excluding all these
5 other sources of production, we're going to find these
6 within the Energy 2020 model, you're narrow -- you're
7 ruling out, essentially, fuel switching because of the
8 way the model is set up, and you're not allowing
9 renewables because of the 33 percent target, you're
10 funneling all those reductions into essentially fuel
11 switching and process efficiency, but the model doesn't
12 have any gains or any improvements in those.

13 So to me, that's one of the possible
14 explanations for why the ARB costs are higher than the
15 Center For Climate Strategy's costs.

16 I'm not going to get into this, but -- talk to
17 you offline, David -- in terms how we -- sorry. This is
18 slide nine -- how we allocate costs, capital costs from
19 new clean energy investments.

20 And then as a reader, you know, it would have
21 been helpful to me -- you do have 160 industry
22 sectors -- to see what those are, the employment
23 outcomes from those different sectors, instead of
24 aggregating them up.

25 And I was also interested in government

1 outcomes in terms of revenue and employment given, you
2 know, your assumptions.

3 So just in summary, you know, I think this --
4 the ARB approach is the best available approach and that
5 the costs are potentially overstated for some of the
6 reasons that I just explained.

7 Thank you.

8 PROFESSOR GOULDER: Thanks a lot, Hal.

9 I'm going to try pull together a lot of the
10 comments that have been made up to now. I would invite
11 other panelists at any point to chime in, comment,
12 agree, disagree, as well as the modelers.

13 I'm going to focus on four things, and four
14 particular areas.

15 One is the issue of leakage.

16 Second, don't mean to beat a dead horse, but
17 hopefully clarify the issue of complementary policies.

18 Third is the issue of fuel substitution and
19 more generally the flexibility that consumers and
20 producers have to adjust their mix of fuels or their
21 composition of their expenditures in the face of
22 changing prices.

23 And the last is technological change.

24 So we've talked about each of these already,
25 but try to pull some of this together. And I do have

1 some slides that should be useful.

2 Let me start with a slide that compares some
3 summary results from three of the models we've talked
4 about today, or three of the efforts, the Air Resources
5 Board's effort using the Energy 2020 and E-DRAM models;
6 the Charles River CRA International model; the model
7 that Tom Tanton has put together; and then I've lumped
8 together two of the US/EPA models that have been looked
9 at for federal policy.

10 And this just to sort of remind you that in
11 some sense for the California models the policy
12 emissions reduction target is approximately the same.

13 The allowance prices vary. There's a lot of
14 uncertainty there.

15 One criticism I would make of the Air Resources
16 Board report is it's not real clear from the report what
17 the range of prices is that emerges from the E-DRAM
18 model, but it is -- closer look suggests it's in a
19 similar range to that in the CRA model.

20 And I'm looking at the policies that are kind
21 of the central case policies, not the, let's say, the
22 unusual cases.

23 But I really want to focus on the last three
24 panels here.

25 In terms of gross state product, the Air

1 Resources Board model suggests percentage change -- and
2 these are all for the year 2020 -- of between
3 2 percent -- a .2 percent loss and a 1.4 percent loss in
4 the year 2020.

5 And as Chairwoman Nichols reminds us, this is a
6 loss relative to a higher value than we'd already be at
7 in 2020 under the Business-as-Usual.

8 The model, the BEAR model that David
9 Roland-Holst mentioned is somewhat more optimistic than
10 the ARB.

11 In the central column, we see the gross GSP is
12 somewhere between minus 1.4 and 2.2 percent loss in
13 2020.

14 Tanton model is about 2 percent loss.

15 And US EPA, again, is for the Waxman-Markey
16 bill. Now the stringency of the policy there is only
17 about three quarters as stringent as AB 32 in terms of
18 percentage emissions reductions, so you probably want to
19 increase -- multiply by four-thirds those numbers.

20 But what you see then is we do have a range in
21 terms of GSP effects. But in some sense, all these
22 model together from one perspective don't suggest a
23 whoppingly large impact on gross state product.

24 In terms of the income gain or loss per
25 household, the next to the bottom row, somewhere between

1 a positive number, \$86 per household and minus 270 per
2 household under ARB's study.

3 Bigger changes under CRA International.

4 And I should mention these are per household,
5 not per person. So the numbers that Paul Bernstein gave
6 us earlier today, the smaller numbers, were per person.

7 Then the central Tanton result using the \$60
8 per ton price of allowances would be \$2,800 cost per
9 household.

10 And then there's issues of jobs affected.

11 Now in terms of as was mentioned by David
12 Kennedy this morning -- or it seems like this morning.
13 Earlier this afternoon. Seems like a long time ago --
14 either a slight gain or what might be considered a
15 relatively small loss.

16 Whereas in the Tanton study, in the middle
17 number there, that minus 485, that's minus 485,000 jobs
18 if we have a \$60 per ton price of allowances.

19 So I think the big question that we're all
20 asking ourselves is: Have we learned anything here?
21 There's all kinds of differences in results ranging from
22 more optimistic to less optimistic.

23 What I'm going to try to do is sort out where I
24 think -- what we can glean from this. I think there are
25 some conclusions that we can draw despite the

1 difference.

2 Next slide, please.

3 And -- next slide please. I see. Keep going.

4 Right. Actually, can you go back two slides. Right
5 there.

6 The thing I want to emphasize here is what was
7 mentioned before, that the allowance value is not the
8 same as economic cost. And all of these projections for
9 economic cost, no matter which model you are looking at,
10 are much smaller than the allowance values.

11 The allowance value, for example, in 2020 could
12 be 7 to \$22 billion in California. That's much, much
13 smaller than the -- I'm sorry -- that's larger than the
14 economic costs.

15 And the reason, as was stated I guess by
16 Michael, is that the allowance value stays in the
17 economy.

18 Now some of it could get lost to other states,
19 but a lot of it stays in California. It's used for
20 various purposes.

21 Some of it could go back directly to
22 households. It could be used to finance government
23 expenditures, so it means effectively reducing the
24 amount of tax increases that the state would have to
25 introduce so that helps consumers as well. Or it could

1 finance -- it could be going to businesses as various
2 subsidies.

3 So that one way or another, most of it stays in
4 the economy, and I think it's important to keep that
5 distinction in mind.

6 Next slide, please.

7 Okay. I'm basically going to settle on this
8 slide for a while and talk about those four issues we
9 manufactured.

10 Board Member Telles was concerned about the
11 issue of leakage. And if you look at the second row
12 here, a minus sign indicates that the item in question
13 in the row implies bias toward lower cost than would be
14 really the case. A plus sign is the opposite. A plus
15 sign means upward bias to the cost.

16 Neither the Tanton model or the ARB models
17 really look at leakage because they are California
18 focused.

19 A nice feature of the CRA International model
20 is that it actually has other parts of the US, and it
21 can look at how higher costs in California lead to
22 changing amounts of investment from California compared
23 to other parts of the country. It can also look at how
24 composition of consumption changes across regions.

25 It's important as Dan Sperling said to look --

1 I'm sorry. That's -- it's important to recognize that
2 leakage can be overcome.

3 So these minus signs are minus signs if it's a
4 policy that isn't doing anything about leakage. But as
5 indicated in the EAAC report, and also as work at the
6 US -- at the federal level has shown, there are ways you
7 can overcome leakage.

8 I won't have time to go into the details, but
9 there are such things as first deliverer policies or
10 output-based allowance allocation or border adjustments
11 that can deal with leakage.

12 So although there are minus signs here, it's
13 not necessarily the case that there's going to be
14 leakage or significant leakage under AB 32. It depends
15 really on policy design.

16 And as just mentioned again, Reid Harvey, the
17 work at US EPA has looked very closely at leakage under
18 Waxman-Markey and shown that output-based allocation can
19 eliminate most of the leakage that would otherwise
20 occur.

21 Second issue that I want to look at is
22 complementary policies. We already -- and so that's the
23 next row where it says restricted scope for preexisting
24 market failures.

25 The ARB analysis I think does a very nice job

1 of looking at potential preexisting market failures. At
2 least they implicitly account for them. As was
3 mentioned, one could try to look at that in more detail.

4 I haven't had a chance to look at David
5 Roland-Holst's recent work, but it certainly assumes
6 there's significant scope for preexisting market
7 failures.

8 The CRA International and Tanton models do not,
9 and so that would suggest an upward bias to the cost.

10 However, I guess I want to pull back on that a
11 little bit. As Dan Sperling said, details count.

12 So even if there are other market failures, it
13 doesn't necessarily mean that complementary policies are
14 going to lower the cost. It's going to depend on
15 design. Some complementary policies might be poorly
16 designed and add to cost.

17 Next slide, please.

18 So I'm going to try to get a little more
19 detailed here, a little bit more concrete. In ARB's
20 analysis -- let's look at one of the complementary
21 policies, Pavley II, alone.

22 In their analysis, and I think it's a nice
23 feature, they look at AB 32 with and without Pavley II.
24 And the presence of Pavley II reduces AB 32's cost.

25 And the reason is Pavley II which, as you may

1 know, it's restrictions on greenhouse gases per mile of
2 automobiles, or it's effectively like tightening fuel
3 economy standards.

4 It really forces people to buy different cars,
5 more fuel-efficient cars, than they would otherwise.

6 The cars become more expensive so there's an
7 additional purchase or capital cost, but the fuel
8 savings exceed those capital costs in that model.
9 That's based on some empirical evidence.

10 In the CRA analysis, this doesn't happen. It's
11 just the reverse. Pavley II effectively, as with the
12 other complementary policies, adds to the AB 32's cost.

13 Which should we believe?

14 Now in the CRA model, it's assumed that
15 consumers are already doing what gives them the best mix
16 between the price of a car that you pay and the fuel
17 savings. They're already optimizing.

18 So any policy that you introduce that forces
19 them to do something else per force is going to make
20 them worse off.

21 So then it really becomes an empirical
22 question: Is it the case that under Pavley II the
23 increases in the prices of cars are going to be less
24 than the present value of the fuel savings? That's an
25 empirical issue that needs to be sorted out.

1 So the fact that you're not -- different views
2 on Pavley II don't necessarily make one view right or
3 wrong. We really need more of the empirical
4 information. And work is being done on this.

5 Next slide, please.

6 So the issue of absence of potential for input
7 substitution, we talked about that, and I think I don't
8 need to say any more. I think we might have different
9 views about it.

10 My own view is that there should be some
11 potential for consumers to flexibly adjust, in
12 particular to sort of wean themselves from energy
13 intensive goods as prices increase.

14 But I can understand there's other views on
15 that.

16 Technological change issue I think is a very
17 important issue. That's the next one. David
18 Roland-Holst had a lot to say about this. The -- yes,
19 stay there please.

20 There is technological change implicitly in the
21 ARB work. I think it's a nice feature in that they've
22 looked closely at not only today's technologies but
23 potential new technologies that are likely to come into
24 place over the years. So it's done -- it is in the
25 model.

1 The CRA International model also has I believe
2 exogenous, sort of built-in technological change.

3 Neither model has policy-responsive
4 technological change, that is that the rate of
5 technological change is altered by policy intervention.

6 That's something which implicitly David
7 Roland-Holst's work attends to by saying there's this
8 .4 percent increase in the rate of technological change
9 when the policy is introduced. It's done in a somewhat
10 cumbersome manner, but that's I think what you're
11 getting at.

12 So I think we can agree that there's going to
13 be some technological change, and moreover that there's
14 probably going to be some policy response to
15 technological change. So I think the absence of that
16 feature does tend to bias upward the cost.

17 And I think in the interest of time I won't go
18 into the others, but these two charts I've indicated,
19 one with model results compared and this one now with
20 the biases, are in the revised appendix to the ARB's
21 economic impacts assessment of the Scoping Plan.

22 It's been substantially revised over the last
23 month. We had more time now to look more closely at the
24 plan and also to consider other models.

25 So there's more than I have time for here, but

1 rather than monopolize the conversation, I was actually
2 hoping that we would get some back-and-forth on these or
3 other issues.

4 Why don't we -- anyone, the floor is open now.
5 If Board Members have questions about any of these
6 points or other points, I think now is a good time to
7 bring them up.

8 BOARD MEMBER SPERLING: Could I ask kind of an
9 overarching question?

10 My sense of this discussion in reading through
11 your reports from the EAAC committee is that there is
12 pretty much agreement about this 0 to 2 percent
13 reduction in cost and, you know, it could be a lot or a
14 little, you know.

15 It's roughly 30 percent growth so the actual
16 growth would be 28 to 30 percent over the next ten
17 years.

18 And so I guess the real question I think for
19 all of us up here is: Is everyone comfortable with that
20 conclusion?

21 Because if you are, then we can move on to the
22 following questions which actually have to deal with the
23 implementation of the equity impacts, the actual design,
24 you know, and there's a lot of questions there.

25 PROFESSOR GOULDER: If you'll let me, I just

1 realized I had two more slides that you offered a
2 perfect segue to.

3 (Laughter)

4 PROFESSOR GOULDER: Let me answer your question
5 with the next two slides. Or partly answer it.

6 The first is, I think we're essentially
7 interested in the overall economic impacts as well as
8 the impacts at the local level. And it's easy to get
9 lost in the weeds with these models.

10 But exactly as you started, the premise of your
11 question was that there are sort of the general
12 conclusion that the -- if I heard you correctly, that
13 the net costs are not terribly large relative to the
14 California economy.

15 I should also mention this comes from models
16 that are very different in their structures and their
17 inputs.

18 So this is -- you put it in terms of total
19 growth over the next decade. If you look at average
20 annual rates of growth, it's just the point you made,
21 that under Business-as-Usual both the CRA analysis and
22 the ARB analysis and Tom Tanton's analysis basically I
23 think assume about 2.4, 2.5 percent growth on the
24 average over the next decade.

25 Under AB 32, it goes down by .1 percentage

1 point under CRA's analysis and by probably less than
2 that under ARB's. So now we can ask the question are we
3 comfortable with that.

4 Let me postpone just for one more second and
5 look at my last slide which I forgot to do.

6 Next slide, please.

7 And there's the question of what about the
8 impact on specific industries. Just the fact that it's
9 small over all, they could be big losers.

10 And a nice feature of the ARB analysis I think
11 is it does show a lot of detailed effects. And in
12 particular, it shows that the energy intensive trade
13 exposed industries could experience significant losses.

14 But again, this is a loss relative to the
15 growth that's going to -- that would occur under
16 Business-as-Usual.

17 So under the ARB analysis, value-added in two
18 industries that are affected the most are mining and
19 utilities. They experience about ten percent loss in
20 value-added relative to Business-as-Usual.

21 But it doesn't mean that value-added isn't
22 growing. It is still growing at a somewhat slower rate.

23 The important point I would make here and it
24 gets to your point of equity is that losses can be
25 reduced or even avoided through other features of AB 32.

1 For example, under the Cap and Trade program,
2 you can avoid losses through output-based free
3 allocation, other forms of free allocation, border
4 adjustments, recycling of optioned revenues.

5 I think that's terribly important and the
6 details count.

7 So that was a long way around getting to an
8 answer to your question, but maybe we should ask others
9 around here. Are they comfortable with these? Do they
10 agree with this general conclusion?

11 My overall assessment here, and I think this
12 comes not just from the ARB study but from all the
13 models together, is the effects are relatively small and
14 that the large effects, the relatively large effects in
15 some particular industries, could be cushioned through
16 specific aspects of allocation or other aspects of
17 policy. You've got a lot of allowance revenue that
18 could be used for compensation, for example.

19 What are other answers to this question? Yeah,
20 David?

21 DR. ROLAND-HOLST: Thank you very much. That
22 was a really able synthesis.

23 I would like to just emphasize those two last
24 conclusions, that the opportunities for adjustment
25 mitigation and the opportunities for innovation

1 potential are areas where I think we could have a new
2 generation of assessment.

3 And really, at this stage, you might call it
4 fine-tuning if you want to, but I think if we have -- we
5 have four models, three of which agree that we're in the
6 less than one percent region most of the time in terms
7 of the overall adjustment, a couple of months of growth
8 in a decade.

9 Then these issues of fine-tuning might actually
10 overcome even those small macro changes, but they would
11 certainly mitigate some of the most important anxieties
12 I think in terms of bottom-up responses to these
13 policies.

14 And I'm talking about everything from the
15 so-called energy intensive or the pollution intensive
16 sectors to things like green micro credit for small
17 enterprises.

18 I mean there's a place where we've got some
19 really big market failure issues in terms of technology
20 adoption. So moving onto that stage, I think, could
21 really be an important component of this agenda.

22 PROFESSOR GOULDER: Tom?

23 MR. TANTON: I think we need to keep in mind
24 that there is both the issue of the size of the change,
25 whether it's two percent or one percent, but also the

1 structure of the change.

2 What we're talking about is a fundamental
3 change in the structure of the California economy
4 further away from manufacturing and more towards
5 services.

6 I think that's an important question as well,
7 in terms of productivity, in terms of wealth creation
8 for the economy as well.

9 There's different kinds of service economies.
10 We could be giving each other haircuts, or we could be
11 doing finance and banking and internet kind of stuff.

12 So that's an important aspect of looking at it,
13 not only is it changing in size, albeit de minimus, but
14 it's changing in nature.

15 We've heard a lot about the energy efficiency
16 improvements that California has achieved over the last
17 two decades. Much of that came from a fundamental
18 change in the structure of our economy as well as the
19 standards and programs.

20 That's all I have to say about that.

21 DR. HANEMANN: To the extent --

22 CHAIRPERSON NICHOLS: I'm sorry. I'm going to
23 interrupt for just a second because I think I need to
24 follow up on that a bit.

25 I don't have charts and slides and numbers in

1 front of me to make this assertion, but I have been
2 briefed fairly recently in southern California about the
3 kind of work that Professor Nelson was talking about and
4 others about what actually is going on in the economy,
5 at least in that part of the state, and the statement
6 that there's been this fundamental shift away from
7 manufacturing I don't think is quite correct. I think
8 maybe there's a --

9 MR. TANTON: Let me rephrase it.

10 CHAIRPERSON NICHOLS: Okay. Because there's a
11 lot of small manufacturers --

12 MR. TANTON: There are.

13 CHAIRPERSON NICHOLS: Lots. And growth in that
14 sector.

15 MR. TANTON: Manufacturing remains exceedingly
16 important.

17 CHAIRPERSON NICHOLS: Right.

18 MR. TANTON: As a percentage of the total --

19 CHAIRPERSON NICHOLS: Right.

20 BOARD MEMBER TELLES: -- it's been diminishing.

21 So it's still important. It's still -- it's
22 bigger than service, but the relative proportion is
23 changing.

24 And it changed in the mid '90s when we came out
25 of our first recession -- or an earlier recession, and

1 we lost much of the aerospace.

2 CHAIRPERSON NICHOLS: Right. Fair enough.

3 Dr. Balmes.

4 BOARD MEMBER BALMES: So just following up on
5 that. So I understand with last energy crisis from the
6 loss of aerospace we lost aerospace manufacturing.

7 But you made the assertion that AB 32 would
8 further accelerate loss of manufacturing, and I'm not
9 quite clear on that. I want to know if everybody else
10 agrees.

11 MR. TANTON: I think what the modeling shows is
12 more reduction in mining and energy than in other
13 sectors of the economy.

14 PROFESSOR GOULDER: That's correct in the
15 absence of some other compensation mechanism like an
16 output-based allocation.

17 MR. TANTON: I would also suggest that when we
18 look at border adjustments that we bring in some of the
19 legal folks. Because some of the border adjustment
20 mechanisms may in fact violate the commerce clause.

21 DR. HANEMANN: Here's the thing. I would make
22 one prediction I think fearlessly.

23 There are not going to be more haircuts as a
24 result of AB 32. There are going to be more installers
25 of insulation. There are going to be more smart

1 monitoring of buildings and energy use and things like
2 that.

3 In other words, this is imparting a particular
4 direction. And there may have been, and I agree it
5 would be regrettable, an increased trend to haircuts
6 over the last 10 or 20 years.

7 But AB 32 is extremely unlikely to push that.
8 In fact, what's happening is the substitution of
9 information for manufacturing.

10 You don't need maybe as big a gizmo, as big an
11 air conditioner. What you need is a smarter air
12 conditioner tied to sensing around the building.

13 And so instead of one big widget, you might
14 have a small widget and lots of sensors. And whether
15 that's -- and that might be classified in part as
16 services.

17 So I think the whole point is a shift. What
18 we're substituting information to provide services, some
19 of which before came from sort of raw physical machines.

20 DR. BERNSTEIN: Can I go back to a previous
21 question?

22 CHAIRPERSON NICHOLS: Sure.

23 DR. BERNSTEIN: I would say from our analysis,
24 whether the cost is a lot or a little, that it shouldn't
25 be that big of a surprise that three of the models come

1 up with similar results because we were asked to
2 standardize on a set of assumptions.

3 So I think to me, at least, when I look at this
4 the second question is fairly important. What if those
5 assumptions are wrong?

6 What do we need to do in terms of the policies
7 to make sure that we have off-ramp safety valves, what
8 have you, in case those assumptions are wrong?

9 For example, I mean just coming back to low
10 carbon fuels. If the assumptions are right that the ARB
11 is using, there's no problem at all.

12 But if it's on the other side or likely, if we
13 look on the electricity sector, it's difficult to bring
14 in renewables for various reasons, whether there's all
15 sorts of siting issues with transmission or the
16 percentage of intermittence on the grid, we can't get as
17 much as we would like, all of that raises the cost, and
18 we need to be careful as we put forth the measures that
19 we have the safety valves and we have the flexibility
20 mechanisms.

21 PROFESSOR GOULDER: To follow up on that if I
22 may, you also did a set of simulations where you used
23 your own assumptions, as it were, for some of the key
24 inputs and cost inputs.

25 How much higher were the costs overall to the

1 economy in those cases compared to the ones that we
2 focussed on here?

3 DR. BERNSTEIN: So we -- all we did is we
4 looked at one particular sensitivity essentially. We
5 looked at the sensitivity for low carbon fuels. And the
6 costs were about 50, 60 percent higher with just raising
7 the low carbon fuels.

8 I mean one could think about higher costs of
9 new sources of electricity. Tom brought up the issue
10 about the wind becoming more expensive because of the
11 demand for wind -- for the wind turbines.

12 There could be various other issues that could
13 come about. So again, I'm not trying to argue whether
14 it's low cost or high cost. I'm just cautioning that I
15 think there is a great range of uncertainty, and there's
16 a range of costs, and so let's implement the policies
17 that allow the flexibility.

18 PROFESSOR GOULDER: David?

19 DR. ROLAND-HOLST: Let me just come back before
20 we leave to Dr. Telles's question about technology in --
21 domestic technology or foreign technology.

22 I think this is a very important point because
23 California as the eighth largest economy has an
24 opportunity to capture this innovation potential.

25 And as the President himself said, it's not a

1 choice of using these technologies. It's a choice of
2 whether we export them or import them.

3 And the example of China is a very good one.
4 But I do global modeling. These are not global models.
5 So you can't capture these linkage effects.

6 But there's no question that we're in a very
7 competitive environment, not just from the Chinese but
8 the Germans are building windmill factories in the
9 United States.

10 These are very high wage economies that remain
11 competitive in manufacturing because they've maintained
12 productivity and they've promoted innovation and these
13 kind of technologies.

14 So I think if -- given the carbon liability
15 that is looming before all of us, and given the scale of
16 the energy sector and the fact that it's responsible for
17 80 percent of GHG emissions, we're looking at the next
18 breakout technology sector.

19 And I think it should take its place among the
20 other knowledge intensive sectors of the California
21 economy, IT and biotech. And the venture community
22 certainly sees that opportunity.

23 Manufacturing, reindustrialization, I don't
24 know how far that will go. But these are manufacturing
25 technologies that we're talking about, and they can be

1 captured if California incubates the market like that
2 with its standards.

3 PROFESSOR GOULDER: I think we have to be
4 careful about how much faith we put in innovation in the
5 following sense: The number of -- the resources -- the
6 people that can innovate, there are only so many.

7 So if you introduce a policy that makes it more
8 attractive to develop the low carbon fuel or fuel cell
9 automobile, et cetera, innovation resources -- that is
10 engineers, scientists, and others are going to be
11 funneled in that direction, but it means there will be
12 less innovation elsewhere.

13 So it's not necessarily a zero-sum game, but
14 it's not as big a positive sum as you might first think
15 because it's a redirection of innovation, and how much
16 of it is a net increase in innovation is another story.

17 CHAIRPERSON NICHOLS: We might have a slowdown
18 in introduction of new cellphones or --

19 DR. ROLAND-HOLST: Apple products, heaven
20 forbid there would be one less innovator at Apple.
21 You're absolutely right.

22 And this issue of capturing the manufacturing
23 component of these new technologies, I think that's an
24 open question.

25 I don't see any reason why we wouldn't be

1 outsourcing a significant amount of this new hardware to
2 the same place as we got our IT hardware from.

3 It's not like the software industry which is
4 mainly skill intensive. There are largely unskilled
5 labor intensive components of that.

6 But let me make one point again in response to
7 Dr. Telles. It doesn't matter whether we import
8 refrigerators or not. We will get the same efficiency
9 gains. Households will save the same amount of money.

10 Now we'd like to capture the manufacturing
11 within the economy too. But if we buy the refrigerator
12 from the state of Nevada or Nicaragua, it doesn't make a
13 difference in terms of the savings that we enjoy. So
14 those multiplier effects will still be there.

15 DR. BUSCH: And Larry, you talked
16 about innovation being in the Charles River model, but
17 it's through this autonomous energy efficiency
18 improvement rate that is lower than the historical rate.
19 Is that correct, David? Is that -- that's what you
20 alter in your innovation run.

21 DR. ROLAND-HOLST: Right, right. Brought it
22 back up to the trend, the last 30 years.

23 DR. BUSCH: And I just think it's worth
24 pointing out the low carbon fuel standard isn't one of
25 these ones that saves money. There is a cost to it.

1 It's just it may reduce cost in the CARB work
2 because the stickiness of capital stock turnover means
3 that the price signal would be more expensive in that
4 model.

5 My sense is that Cap and Trade is cheaper in
6 the Charles River model because there's more fluidity in
7 response to the price.

8 Or maybe you could -- I mean we talked about
9 the sectoral differences, disaggregation being a
10 possible reason that there are persistent -- there are
11 differences in cost between the ARB and CRA work, and
12 you thought that that wasn't the reason CRA comes up
13 with higher costs, even when there's harmonization.

14 Could you help us understand where the
15 differences come from to the extent even when you're
16 working with harmonized costs?

17 DR. BERNSTEIN: I think you're right about
18 the -- you said what, the stickiness?

19 I mean I think the issue in terms of the cost
20 difference, I think there are a couple things. Larry
21 identified them. That we weren't as harmonized in some
22 of the scenarios as we should have been.

23 As Larry pointed out, the VMT measure, there
24 was a difference in terms of how we represented it. We
25 represented it with a cost. The ARB, there is not a

1 cost to that.

2 On the -- on some of the consumer side issues
3 which we're talking about in terms of those market
4 failures, the -- we actually do account for some market
5 failures with our energy efficiency on the electricity
6 side.

7 There are some -- if you look at our report, we
8 have basically a supply curve for DSM or energy
9 efficiency. There is some energy efficiency that would
10 come in at quote negative costs or, you know, the
11 benefits exceed the costs.

12 But for the large extent, we find that no, the
13 costs exceed the benefits.

14 And some of it goes back to Dr. Hanemann's
15 point about where the consumer preferences are.

16 When -- going back to Larry's car example, what
17 we're saying is when people pick a car, that they're
18 picking it for a set of attributes, not just fuel
19 economy.

20 So if you want to look at just the operating
21 costs and the capital costs, I think the CRA model would
22 actually find something similar to the ARB model,
23 actually increasing the efficiency would save in terms
24 of lifetime costs.

25 But when you're doing that, you're moving to a

1 vehicle that maybe has less room, less horsepower, some
2 other attributes are changing. And the consumers have
3 said that they value those attributes. So if you're
4 pushing them away from those, you're causing a loss in
5 welfare.

6 Now we can argue are consumers making smart
7 decisions or not. Okay. Won't do that.

8 But that's what, just in terms of the model
9 working, when you go to the ARB model, it's basically,
10 the Energy 2020 model -- and Dave, please correct me if
11 I'm wrong.

12 The Energy 2020 model is basically looking at
13 life cycle cost, and it's not taking into account those
14 consumer choices.

15 So it's not taking account of any of the, you
16 know, kind of nonquantifiable or difficult to quantify
17 services such as roominess, horsepower, what have you.
18 It's not quantifying those when it's making the choice
19 in its model.

20 Now what it does have is it has this function
21 in there that makes it -- that you have to have a cost
22 difference to get the consumer to substitute into the
23 more efficient vehicle, more efficient technology.

24 You have to have a cost difference above what
25 the lifetime savings would be.

1 And to get more and more switching into the
2 efficient technology, you need a bigger and bigger cost
3 difference. Okay?

4 So if you're going to have it as a market-based
5 policy, that's what you need.

6 Therefore, if you move to a nonmarket-based
7 policy where you just mandate consumers to switch to
8 this new efficient technology, by definition or by
9 construct of the model, it improves welfare.

10 Because now you just move them there. They all
11 go there. They take this more efficient technology that
12 has lower life cycle cost. That improves welfare.

13 On the flip side, CRA makes the assumption that
14 there aren't the market failures, and so by forcing the
15 consumers away from where they want to be, by definition
16 or model construct, there is a cost of doing that.

17 I don't know if that helps.

18 CHAIRPERSON NICHOLS: Well, I think we all have
19 things we'd like to jump in and say at this point.

20 BOARD MEMBER SPERLING: I'll pass for now.

21 CHAIRPERSON NICHOLS: Okay.

22 I had a question that was just a question of
23 interpretation of one of the slides that were presented
24 by Hal.

25 And that was a comment, I think it was like the

1 second to the last slide, where you said we should
2 incorporate energy efficiency into the cost of doing
3 business and not treat it as a separate measure.

4 Do you recall where that was? And I just -- I
5 wasn't sure what exactly you meant by that because we do
6 have energy efficiency -- we have a lot of energy
7 efficiency assumed in the baseline of our Scoping Plan.

8 But then we're also adding requirements for
9 extra efficiency on top of that, and I wasn't quite sure
10 whether you meant that should be taken out of the
11 equation in terms of the additional costs of whatever
12 the installation or the equipment are.

13 So a small point I guess, but just --

14 DR. NELSON: Thanks for the clarification. I
15 guess my comment was primarily ontological more than
16 anything else for changing their world view about --
17 maybe, you know, getting academics to change their world
18 view is a moot point.

19 But I think in the dialogue it's important to
20 say that this is a portfolio of policies and that demand
21 side management is the foundation of the policies in the
22 sense it is -- it paves the way for the other higher
23 cost options, right? Because you have cost savings from
24 the demand side work, and that goes to help subsidize on
25 a statewide basis these other more expensive policies

1 like renewables.

2 CHAIRPERSON NICHOLS: Well, demand side
3 management is the officially adopted loading order for
4 the State of California, right? So I mean it's in the
5 regulations now for the PUC, the Energy Commission,
6 everybody else, that before you look to anything else
7 you look to demand management.

8 So I guess you're saying that should be
9 assumed?

10 DR. NELSON: I'm agreeing with that, yes.

11 CHAIRPERSON NICHOLS: Okay.

12 DR. NELSON: I'm not telling you anything you
13 don't already know.

14 CHAIRPERSON NICHOLS: No, no, no. But I don't
15 mind hearing it.

16 DR. NELSON: Happens a lot with my wife.

17 CHAIRPERSON NICHOLS: Okay.

18 Have you incorporated the questions that you
19 received on the cards, or is it now time to -- because
20 otherwise, I'm sure the Board Members could happily keep
21 this group engaged with our own questions and comments.

22 DR. KEVIN KENNEDY: Yeah. And we have a
23 listing of the questions and comments, and it probably
24 is a good time to start dealing with them.

25 CHAIRPERSON NICHOLS: Okay. We did have one

1 more Board Member question here.

2 BOARD MEMBER TELLES: Question on the energy
3 efficiency, on Professor Roland-Holst slide 9.

4 You have kilowatt per hour on the Y axis and
5 then time on the X axis, and this is a slide we're all
6 familiar with. The California economy is very
7 efficient.

8 Has that translated into consumer savings also?
9 I mean I have the impression when I read newspapers that
10 the cost of electricity in California is so much more
11 expensive.

12 I'll give you an example. The cost of
13 electricity in Fresno where I live for a household is
14 about twice as much as it is for a household in Tucson,
15 Arizona. And because a lot of this, the cost would be
16 reduced by the efficiency, but are we seeing that
17 already with what has happened by the California
18 economy?

19 DR. ROLAND-HOLST: In answer to -- the very
20 direct answer to your question is this estimate came
21 from CEC, and it does include -- it is adjusted for
22 price differences between the national average price and
23 the California state price.

24 So yes, households saved over this time period
25 \$56 billion.

1 My estimate of the multiplier effects of those
2 savings was additional 1.4 million jobs over the same
3 period were created by diverting that demand from energy
4 to more traditional spending patterns, haircuts,
5 espresso drinks, and Walkmans and lots of other fun
6 things that consumers like to buy.

7 But that job creation also had a follow-on of
8 forty-five billion in new payrolls that would not have
9 been there if we hadn't been able to recycle those
10 savings.

11 But the actual estimate of the savings, to
12 answer the question specifically, is adjusted for rate
13 differences in California, and it's an official estimate
14 of the California Energy Commission, not my number.

15 CHAIRPERSON NICHOLS: Okay. Are we ready to go
16 with the audience questions? Okay.

17 DR. KEVIN KENNEDY: Before we get started, part
18 of what I'm about to do is we had typed up the questions
19 and I'm going to hand them out to the people to more or
20 less -- we were hoping to organize them into themes, and
21 we found that we were not terribly successful at doing
22 that.

23 There's a lot of divergent sort of questions
24 around. Some of them are relatively simple. Some of
25 them are probably things that we may need to end up sort

1 of taking off line rather than getting into detailed
2 answers here.

3 CHAIRPERSON NICHOLS: Okay. Do we have an
4 actual time when we have to end?

5 MR. TANTON: Yes.

6 (Laughter)

7 CHAIRPERSON NICHOLS: Tomorrow? Midnight?
8 This was scheduled to go to 5:30. I'm sure many of us
9 would be happy to stay at least a half an hour longer if
10 that's necessary to also allow for public comment.

11 DR. KEVIN KENNEDY: And actually we will also
12 start passing out another set of cards for people who
13 feel like they also want to have a chance to get up and
14 speak themselves. And then we'll collect those.

15 But hopefully these will take care of most of
16 the questions and concerns folks had.

17 CHAIRPERSON NICHOLS: Let's hope. Okay.

18 PROFESSOR GOULDER: Okay. The first question
19 is by Ray Williams from Pacific Gas & Electric. The
20 question is directed both to Dave Kennedy at ARB and
21 Paul Bernstein at CRA.

22 The issue is:

23 How did you model cost and emissions
24 reductions for complementary measures
25 specifically in scenario 1 versus

1 scenario 5?

2 So I think it's important first to explain what
3 the two scenarios are and then be specific about how the
4 complementary measures were modeled.

5 David, do you want to go first?

6 DR. DAVID KENNEDY: Okay.

7 So the cost of complementary measures, how they
8 were modeled is going to be different depending on the
9 measure. Cost . . . Okay.

10 Scenario 1 versus scenario 2.

11 PROFESSOR GOULDER: 5.

12 DR. DAVID KENNEDY: Should be 5 okay.

13 So in scenario 1, we assumed that the targets
14 expressed in the complementary measures were fully met
15 or at least met to the extent that the model could find
16 them.

17 An energy efficiency measure, what we did was
18 essentially treat it like a standard where we increased
19 the marginal efficiency of new devices that would flow
20 into the economy, and with that increase in marginal
21 efficiency came an increase in the cost of the device
22 and an estimate of the fuel used by the device. So that
23 would be similar for the vehicle strategy also.

24 And I think those are the only two that dealt
25 with efficiencies.

1 For renewable standard, we built renewables
2 pretty much in the manner that's expressed in the July
3 PUC report using the costs that were used in that same
4 deliberation.

5 For the CHP, we set a target for 30,000
6 gigawatt hours, but the model did not find that amount
7 of CHP available. So quite a bit less was actually
8 found. The cost of that dealt with the cost of the
9 equipment necessary to do the CHP.

10 For the VMT measure, we actually do not have a
11 cost estimate for that in 1 which is why it's excluded
12 in Case 3 and Case 5 so what we are looking at is
13 basically disinvestment in vehicles and fuel from a
14 reduction in VMT.

15 Am I out of complementary measures yet?

16 Oh, LCFS. Yes. LCFS is strictly we require a
17 percentage of the fuels in California to be made up of
18 biofuels, and they come at an assumed price.

19 DR. KEVIN KENNEDY: Paul?

20 DR. BERNSTEIN: Okay. So specifically kind of
21 a simple answer to what's the difference between 1 and
22 5, the only change -- essentially, the only change in
23 the model is that we reduce the stringency of the
24 various complementary measures.

25 So for example, if we take the RPS in scenario

1 1, it's meant to be a 33 percent RES, and it's basically
2 modelled as the model chooses the technologies, the
3 least cost technologies to meet that 33 percent RES and
4 actually could exceed the 33 percent if it proved cost
5 effective at the prevailing permit prices.

6 Then in scenario 5, that measure was removed
7 and we just have the 20 percent RPS. And again, the
8 model is allowed and in fact we find does actually
9 slightly exceed the 20 percent RPS so it's a minimum
10 constraint.

11 Likewise with the others would be, the LCFS,
12 instead of scenario 1 you have to be 90 percent as
13 energy intensive as conventional fossil fuels -- or
14 current fuels.

15 And in scenario 5 you have to be 95 percent.

16 But again, the model, if it found that it was
17 cost effective to do so, could exceed that 95 percent.

18 PROFESSOR GOULDER: Okay. Dave Kennedy, we've
19 got another question, a very specific one, for you from
20 Jim Lazar from Microdesign Northwest. The question is:

21 Are energy efficiency measures required
22 by AB 2021 and VMT measures required by
23 SB 375 imbedded in the reference case --
24 that is the Business-as-Usual case -- or
25 are these in the AB 32 policy

1 implementation case?

2 DR. DAVID KENNEDY: I'm not sure what's
3 required by AB 2021, but the energy efficiency and the
4 VMT measures are in a policy case, not the reference
5 case.

6 So I'm not sure if 2021 would include
7 efficiency that is built into the IEPR baseline
8 forecast. Could someone help me on that one?

9 DR. KEVIN KENNEDY: I'm not sure either
10 offhand, but I do -- I think that the relevant point is
11 that the energy efficiency included in the reference
12 case is the energy efficiency that was included in the
13 Energy Commission's demand forecast and includes, I
14 believe, just what is currently committed from the
15 existing utility programs.

16 And my guess is that there's a portion of
17 what's required under AB 2021 that is incorporated into
18 that, but as you look past probably about 2012 very
19 little from 2021 is incorporated and it would be in the
20 policy case instead.

21 PROFESSOR GOULDER: One of the things the EAAC
22 said in our appendix is that we thought an attractive
23 feature of ARB's work was they spent a lot of attention
24 and effort to try to get the Business-as-Usual case
25 right to include those policies which would be there

1 under Business-as-Usual and to put in the policy
2 implementation case other policies that wouldn't be
3 there.

4 That was a criticism of the earlier work by
5 ARB, and I think they responded pretty well to that. At
6 least that was the view of the committee.

7 Here's another question for Dave Kennedy from
8 Hank DeCarbonel from Concrete Pumpers of California, a
9 quick question:

10 Please explain the difference between GDP
11 and SDP and CARB SDP.

12 DR. DAVID KENNEDY: Well, gross domestic
13 product is usually reserved for the product at the
14 national level, while state domestic product or GSP
15 would be reserved for the product at the state level.

16 I'm not sure what separation with CARB SDP
17 would be.

18 (Comment off the record)

19 DR. DAVID KENNEDY: And the measure of GSP also
20 includes taxation along with value-added if I'm
21 remembering correctly.

22 (Comment off the record)

23 DR. DAVID KENNEDY: GSP measures the value
24 at -- the returns to labor and capital in the state plus
25 taxes plus -- somebody else help me out here if they

1 know off the top of their head the definition?

2 CHAIRPERSON NICHOLS: The question I guess
3 would be did you create some new category that hadn't
4 existed before?

5 DR. ROLAND-HOLST: It's the counterpart of GDP
6 at the national level.

7 (Comment off the record)

8 DR. ROLAND-HOLST: That's GDP accounts. They
9 include taxes.

10 PROFESSOR GOULDER: Okay. We've got a lot of
11 questions so try to move --

12 DR. ROLAND-HOLST: Only producer taxes,
13 value-added, right? Producer taxes. Not income taxes.
14 Producer taxes and factory taxes. Does not include
15 household taxes.

16 PROFESSOR GOULDER: Okay. We have a question
17 from Jason Orta of California Workforce Development.
18 His question, which could apply to any of the modelers:

19 Have any of the analyses looked at the
20 effects of AB 32 on wages if we switch
21 from carbon-intensive fuels to a less
22 carbon-intensive economy?

23 So in other words, what's the effect of AB 32
24 on wages, allowing for the compositional changes in the
25 economy? Anyone want to report the results in their own

1 model?

2 DR. BERNSTEIN: I don't have them offhand, but
3 we certainly do -- I would think all the models do. I
4 mean there's an equilibrium wage rate. There's a wage
5 rate, and we have a change in that. I don't know what
6 it is off hand, though.

7 PROFESSOR GOULDER: Can you tell us the
8 direction?

9 DR. BERNSTEIN: Down. In all the policies,
10 it's down. I mean the wage rate declines under all the
11 policies.

12 DR. DAVID KENNEDY: I think I would -- off the
13 top of my head, I see slight increases in the wage rate
14 across the board.

15 PROFESSOR GOULDER: I think this is also
16 consistent with the difference in employment effects.

17 What you get -- I think it's because of
18 differences in labor intensities --

19 DR. DAVID KENNEDY: And also I think because of
20 migration. We actually keep people from migrating into
21 the state which has the effect of driving wage rates up.

22 PROFESSOR GOULDER: Right. So that's an
23 important difference between the CRA and ARB analyses in
24 terms of the effects on wage rates and on employment,
25 although the effects are pretty small in either

1 direction. Okay.

2 James Fine from EDF, Environmental Defense
3 Fund, refers to the issue of price volatility. He would
4 like to correct the claim that allowance price
5 volatility is a real problem.

6 And so perhaps someone could perhaps comment or
7 weigh in on the question of whether it's a real problem
8 or not.

9 And I think one has to recognize whether it's a
10 problem or not will depend in part on policy design and
11 whether there's such a thing as a safety valve or price
12 ceiling established.

13 MR. TANTON: That's what I going to say, Larry,
14 exactly. As I heard it, and I think as I spoke it, it's
15 a real concern. That's different than it is a problem.

16 It's something we need to pay attention to in
17 promise design and mechanism design and evaluation.

18 It can be a problem. It has been a problem
19 elsewhere. It's not necessarily a problem if we keep
20 our eyes peeled.

21 DR. BUSCH: Dr. Fine showed me his graph that
22 he references, and he basically compares volatility in
23 the EU market where there are not price collars to
24 volatility in gas and oil markets to show that, you
25 know, there's volatility in markets, and the volatility

1 in the price of carbon has been less than these other
2 markets.

3 PROFESSOR GOULDER: What markets is he
4 comparing with?

5 (Comment off the record)

6 DR. BUSCH: Coal, oil, and gas commodities, Dr.
7 Fine says.

8 PROFESSOR GOULDER: Okay. Thank you, Chris.

9 This has become a judgment call in some sense,
10 whether you consider a certain amount of volatility
11 large or small. But at least there are a lot of folks
12 that are concerned enough that they feel the appropriate
13 policy should have a price ceiling or safety value.

14 MR. TANTON: It's not just a price ceiling.

15 Keep in mind, particularly with respect to
16 banked permits, there's the issue of potentially
17 stranded assets, devaluing something you've already paid
18 for.

19 PROFESSOR GOULDER: Can you elaborate on that?

20 MR. TANTON: Suppose I bought at auction a
21 permit for 2012 at \$100, and the price plummets in a
22 future year. I have now a stranded asset.

23 PROFESSOR GOULDER: So you're suggesting you
24 would favor both a price floor and ceiling?

25 MR. TANTON: That's why I suggested a collar.

1 As one mechanism.

2 PROFESSOR GOULDER: Right. Okay.

3 DR. BERNSTEIN: I think there's some industries
4 that actually kind of monthly volatility is an issue,
5 and then there's also an issue of, I think Tom's getting
6 to, having some price certainty is important to some
7 industries when it comes to long-term planning.

8 PROFESSOR GOULDER: We've talked a lot, and
9 perhaps more than we want, about market failures.

10 But here's a question that I guess we need to
11 respond to. It's from Ralph Moran at BP America. He's
12 asking for clarification about what market failure each
13 complementary is designed to address and how this
14 addresses it.

15 Now I think it's true that we have been
16 somewhat vague with perhaps some exceptions about the
17 market failures.

18 I could mention one. And that's the principal
19 agent problem or the problem that occurs in rented
20 buildings.

21 There is a market failure in that if the
22 building is -- the tenant may not have a direct
23 incentive to reduce energy use or electricity use if
24 that's -- if he's not paying for the amount of variable
25 costs based on use if it's somehow built into the rent

1 already.

2 And that means that Cap and Trade to the extent
3 that it raises electricity prices may have a muted
4 effect on the energy use by a renter.

5 There's sort of a gap between the incentives of
6 the policy and that's ultimately felt by the consumer.

7 So a complementary measure in this case would
8 be a building efficiency code which requires that
9 insulation be put in to help reduce energy needs rather
10 than operate on price basis.

11 Michael?

12 DR. HANEMANN: So first of all, there are a lot
13 of rented commercial buildings. In other words, if you
14 just think this is apartments and how many apartments in
15 California. Many commercial buildings are in fact
16 rented.

17 And a second element is for homeowners on the
18 residential side. There a perception that if you invest
19 in improving efficiency you won't get this back when you
20 sell the house.

21 And there was a very interesting study done
22 about 20 years ago of house price, what's called a
23 hedonic study, what prices houses sell, which in fact
24 found imperfect capitalization of energy efficiency
25 investments.

1 So this is sort of an issue that's wider than
2 just the number of homes in California, the number of
3 households that rent.

4 CHAIRPERSON NICHOLS: My understanding is that
5 commercial buildings in California, except for those
6 that are brand new, almost never are sold because of
7 Prop 13. They would get reevaluated and retaxed at that
8 point.

9 So I guess that leads to sort of a general
10 comment that I have that I would love to hear addressed
11 which is: This kind of assumption when we're talking
12 about models, that you're living within a closed
13 universe, and even though at the end of your comments
14 several of you did talk about policies outside the
15 design of the Cap and Trade program or outside the AB 32
16 program as it currently exists that could be used to
17 address some of these issues, one of the things that I
18 think makes the public discourse on this so difficult
19 is, just as right now, the moment anyway, I'm finding
20 that many people don't actually know what is in AB 32
21 and what isn't.

22 And therefore because it's getting all the
23 publicity it's assumed that everything people are mad
24 about with respect to government regulation or at least
25 environmental regulation is somehow part of AB 32.

1 But the other side of that is that a lot of the
2 things that people are unhappy about in our state, the
3 quality of the schools, the quality of the
4 infrastructure, you know, the budget situation, are
5 truly not within the scope of AB 32.

6 And yet without addressing some of those
7 issues, we may not be effectively able to just make all
8 the other issues go away.

9 I mean the questions that have been asked about
10 wage rates, for example. Well, you know, if somebody is
11 installing a new pump at a gas station and that pump is
12 going to have biodiesel instead of regular diesel, or
13 some other alternative fuel, there is no difference in
14 the work of the construction worker who is actually
15 putting -- or the pipefitter who is putting that new
16 pump on the island.

17 In fact, it's just a good job, something he
18 could attribute to our program.

19 On the other hand, if people shift away from
20 materials they're using now that are being produced in
21 places that are unionized and have high wage jobs, and
22 new solar plants are not hiring people at union rates,
23 then there's -- that's a loss.

24 Now how does AB 32 either make that happen or
25 not make that happen?

1 I mean the changes are going to occur, I
2 believe, regardless actually whether AB 32 exists --
3 other policies of the nation and the state eventually
4 are going to cause us to shift -- we're already clear
5 we're moving in the direction of more renewables whether
6 there ever was a carbon program.

7 And yet again just within the four corners of
8 these models, AB 32 or the Cap and Trade program takes
9 the hit for this -- these bad shifts that are happening.

10 So I guess that's a kind of a general question
11 about models and what can we do with that.

12 PROFESSOR GOULDER: The shifts are happening
13 already, say under the reference case or
14 Business-as-Usual case.

15 But another question is, how much is the
16 further change that is occasioned by AB 32?

17 So the models try to get in the reference case
18 under the baseline the shifts that are already happening
19 to get them to some degree.

20 But then in addition, they try to say how much
21 do you depart from that baseline when you introduce
22 another change to the policy environment?

23 And as we saw, we have a difference, for
24 example, between the ARB results and the Charles River
25 results that partly maybe due to differences in assumed

1 labor intensities of the different industries that are
2 contracting or expanding.

3 There's other reasons as well as David
4 indicated.

5 So I think the models do attempt to get at
6 that, both in the baseline and in the policy change
7 cases. But that's the good news. The bad news is they
8 sometimes come up with different results.

9 However, I would emphasize again that the
10 impacts on employment tend to be pretty small. So even
11 though they differ, they don't differ by a wide amount
12 in terms of aggregate employment.

13 CHAIRPERSON NICHOLS: Okay. Thanks. I think
14 you have more questions?

15 PROFESSOR GOULDER: We have lots more. Tell us
16 when we have to stop.

17 Okay. Here's a question for Paul Bernstein
18 from Norm Pedersen from Hanna and Morton, LLP. On CRA
19 slide 4, there's four percent offsets that lowers the
20 permit price by 33 percent. The question is:

21 Why would going to Waxman Markey reduce
22 the permit price by another additional
23 33 percent?

24 DR. BERNSTEIN: I'm not sure if the question is
25 thinking that we have a constant of 33 percent in our

1 model. But we don't. The numbers just work out that
2 way.

3 I mean I think the main take away from the
4 issue is just adding more offsets reduces the cost
5 further. So having more -- I mean, as I said, it just
6 happened to work out that it was symmetric there.

7 PROFESSOR GOULDER: Okay. And a question now,
8 David -- it says:

9 David Roland-Holst suggested an
10 additional 4 percent energy efficiency is
11 needed. Where is this anticipated to
12 come from if the current policy is
13 100 percent of the effective energy
14 efficiency?

15 DR. ROLAND-HOLST: I don't completely
16 understand the second half of the question, but I have
17 to apologize if the slide wasn't clear.

18 It's a 0.4 percent per year, a much smaller
19 energy efficiency increase. And it's actually
20 consistent with the State's 30-year experience with
21 energy improvements.

22 PROFESSOR GOULDER: Well -- okay.

23 DR. ROLAND-HOLST: There's more on mine. Do I
24 answer it? This is from Hanna Morton, and it says:

25 Roland-Holst and Bernstein provide

1 diametrically opposite results.

2 Certainly there's some disparity in our
3 results, but I was surprised how congruent they are. I
4 mean they are the same in sign in many cases, but the
5 difference in magnitude is tenths of a percent.

6 So I don't really have much to say there except
7 that we've already spent a long time talking about those
8 differences.

9 PROFESSOR GOULDER: This could well be a
10 question that requires a long answer, so I encourage
11 answers that are short. It's from Frank Harris at
12 Southern California Edison:

13 Presentations today are highly driven by
14 input assumptions. How would or should
15 ARB design its approach to facilitate
16 such compliance?

17 DR. BERNSTEIN: I think that gets back to what
18 I was trying to say before that we don't really know how
19 technology will be. We don't know how the economy is
20 going to grow.

21 So again, beating a dead horse, flexibility is
22 important.

23 So whether that's, you know, sorry to introduce
24 the controversy over RECs or whether there's some kind
25 of, with LCFS, if there are tradable credits, if there's

1 some kind of price cap on those credits, if the fuels
2 prove to be difficult to come by.

3 We've heard about price collars. I think those
4 are a good idea.

5 I would also advocate that there's a decent
6 amount of offsets available, and that's how, you know,
7 some approaches to deal with all the uncertainty.

8 PROFESSOR GOULDER: We have a question from
9 Bonnie Holmes-Gen from American Lung Association of
10 California, or ALAC.

11 Question/comment is: She recommends that CARB
12 include a fuller accounting of co-benefits, air quality,
13 public health, and other co-benefits, from climate
14 policy in the economic analysis.

15 She refers to Roland-Holst's 10 billion in
16 ozone related illness -- \$10 billion I suppose -- in
17 ozone-related illness and death.

18 Is that under the baseline?

19 DR. ROLAND-HOLST: That's a completely
20 different study of climate damage.

21 PROFESSOR GOULDER: But the question then is:
22 How will CARB build this element, namely
23 these co-benefits, and quantify the
24 co-benefits into the analysis going
25 forward?

1 So it could be Dave?

2 DR. KEVIN KENNEDY: One of the things that we
3 did do as part of this analysis was look at the reduced
4 cost for otherwise reducing the criteria of pollutants.

5 I'm sort of trying to move to something where
6 you would actually be -- and Michael may want to jump in
7 when I'm done -- that it's very difficult to sort of
8 take the sort of changes you would see from the climate
9 policy and quantify that into actual public health
10 benefits.

11 We are doing some work with the Department of
12 Public Health to try to get a better handle on the
13 health -- doing a health impact assessment around the
14 Cap and Trade program and understanding those sorts of
15 changes.

16 But whether those can be quantified in a way
17 that can be readily fed into the economic model is
18 another challenge.

19 DR. HANEMANN: I just wanted to say that this
20 is what Smith and Carbone have done.

21 And what -- quickly. There's the issue of
22 data, but there are also methodological issues including
23 particularly calibrating what's called the utility
24 function underlying the analysis.

25 They came out with a way to do the calibration

1 if you have data. And so it's sort of another level of
2 model building.

3 But it's doable, and obviously you want to
4 choose some impacts that are very important and there's
5 a lot of data at first, and then later on add on other
6 things as time passes.

7 MR. TANTON: If I could add, I think it's
8 important to keep in mind that any monetization of those
9 benefits be done using avoided damage function rather
10 than supply curves or cost of control sort of curves.

11 Reminds me of a model developed at the Energy
12 Commission back around 1985 called air quality
13 evaluation model that monetized based on how materials
14 effects the avoided damages from a marginal change in
15 NOX and SOX and et cetera.

16 And I think that methodological approach is
17 much more sound than a cost of control approach because
18 it actually measures the avoided damages.

19 PROFESSOR GOULDER: Here is an important
20 question, and we're going to have to ask the author to
21 identify him or herself.

22 It says:

23 The analysis lacks -- it's referring to
24 ARB analysis -- the analysis lacks a
25 discussion about the near-term impact on

1 the California economy. If industry is
2 to innovate, how will industry be
3 impacted in the earlier years,
4 particularly taking into account
5 consideration of California's current
6 downturn and industry's limited access to
7 capital?

8 And now I see the author is the Brenda Coleman
9 from California Chamber of Commerce.

10 David?

11 DR. DAVID KENNEDY: While we don't present any
12 near-term macro results, they would largely be similar
13 to what you're seeing in later years.

14 Permit prices are low in early years which
15 would require very little to have to be done.

16 Implementation of any of the complementary
17 policies are also phased in over time so there are not a
18 lot of investments happening early on.

19 In the chapter in the report, I do show how
20 investments phase in over time. And while I think we
21 might have something to show how prices grow over time,
22 early-year impacts should not be expected to be anything
23 large.

24 DR. ROLAND-HOLST: I'll speak very briefly to
25 that.

1 The policies at the moment are progressive, and
2 I think the adjustment process will be likewise
3 progressive.

4 PROFESSOR GOULDER: You mean increasingly
5 stringent?

6 DR. ROLAND-HOLST: Increasingly stringent.

7 But gradually. They'll be gradualist policies,
8 let's put it that way. May be more appropriate.

9 But for the innovation scenario, I also made
10 that essentially a gradualist innovation process,
11 although I didn't model the innovation process
12 endogenously. I specified that as a scenario.

13 But there is a very interesting question
14 particularly if we see economic gains in some of these
15 policies at the end year. And that basically has to do
16 with borrowing from the future in order to finance some
17 of these adjustment policies.

18 And there's some really interesting
19 possibilities there that we haven't even begun to look
20 into those mechanisms.

21 DR. BERNSTEIN: I think that all the models
22 though may have a shortcoming when it comes to really
23 looking at the near-term impacts when it comes to
24 investment.

25 I think the CRA model, for example probably --

1 I'm sure it doesn't have enough detail to really look at
2 what needs to take place in terms of investment and new
3 technologies and what have you to start meeting some of
4 the regulations.

5 DR. ROLAND-HOLST: Not only that but some of
6 these investments are lengthy. In the power generation
7 sector, you're talking about 30-to-50-year commitments
8 of very large irreversible capital goods, so this is
9 something we need a little more insight to.

10 DR. HANEMANN: And this is what I was getting
11 at by saying that these are equilibrium models and they
12 don't deal with speed of adjustment or cost of
13 adjustment.

14 And so there are two pieces.

15 I think there should be some attempt to think
16 of these factors and put in, as it were, diffusion
17 curves or get some idea of what about.

18 And the other side of that is designing
19 policies which give some degree of flexibility.

20 I just want to add one other thing with
21 flexibility. There's flexibility and flexibility.

22 What I mean is some flexibility can be gamed.

23 If you have automatic -- certain automatic
24 adjustment rules: If I know something is switched off
25 if the price hits, you know, 12 dollars.

1 Let me put it that way. There's some
2 experience with commodity prices. There's a famous
3 story of Gallo buying -- contracting long-term contracts
4 for wine grapes, but it was triggered to a particular
5 price and particular market.

6 If you could push the price over a threshold,
7 maybe for an hour or two on a certain day of the year,
8 you switched off.

9 So my point is that the mechanisms, whether a
10 collar or other things, need to on the one hand provide
11 flexibility, but they need to be designed so they're not
12 so predictable that they can be gamed.

13 That's all the more reason why it's important
14 that CARB get on to that phase.

15 PROFESSOR GOULDER: Here's an important
16 question about flexibility, but it looks like it applies
17 more to the policy itself than to the modeling. It's by
18 Frank Harris again from Southern California Edison:

19 It's clear from the presentations given
20 today that the results are driven by the
21 input assumptions. As a result of this
22 assumption sensitivity, some of the
23 reports recommended that the programs be
24 designed, the policies be designed to
25 include or facilitate some level of

1 flexibility. This would be a recognition
2 of the potential that the assumptions may
3 be wrong. The question then is --

4 And I think that is a correct depiction of
5 what's in the EAAC report, for example, emphasis on
6 making policies flexible, acknowledging some of the
7 gaming issues you mentioned.

8 So the question then is:

9 How would or should the ARB design its
10 approach to facilitate such compliance?

11 Now it sounds to me like this is a question
12 about the policy design as opposed to the modeling, but
13 if anyone wants to take it, or anyone on the Board wants
14 to take it, that would be fine.

15 Anybody?

16 MR. TANTON: I think we want to do good and
17 avoid evil.

18 CHAIRPERSON NICHOLS: That's good.

19 I was just going to say that AB 32 has written
20 into it a five-year mandatory review of the Scoping Plan
21 as well a Scoping Plan itself which is not -- would not
22 have necessarily been assumed to be something that you'd
23 have to have.

24 And I believe the reason for that is the
25 recognition that we don't know everything we need to

1 know sitting there today.

2 It's hard enough to predict what the economy
3 will look like in 2020, much less in 2050 when most of
4 us are not likely to be here to find out whether we were
5 right or not.

6 So the only thing you can do is to take this in
7 in pieces and try to look at it every few years and see
8 if you're taking advantage of what you have learned.

9 We've already learned in the short period of
10 time since AB 32 passed that projections about
11 Business-as-Usual weren't correct.

12 Nobody, with all respect to the economics
13 profession, predicted the extent of the recession at
14 that time.

15 And that's left us now with some -- in a
16 helpful way, I guess -- with some room to ramp up the
17 program a little more slowly if we want to do that in
18 order to take account of uncertainties.

19 But this is the kind of thing that I think we
20 have to assume, not recessions perhaps, but, you know,
21 unprecedentedly severe recessions, breakthroughs in
22 technology, changes in global patterns of development,
23 et cetera, that we can't really know.

24 DR. NELSON: I think that's a really important
25 point. And there's a big literature on adaptive

1 governance which is essentially what you just described.

2 One of the hallmarks of adaptive governance is
3 essentially decentralization of decision-making down to
4 the local level.

5 And, you know, I think in the larger climate
6 change kind of social science research indicates that
7 climate policy is an elite debate and citizens in fact
8 don't understand it, as Chair Nichols expounded on.

9 And so I think it's important to get, you know,
10 the outreach mechanisms and stakeholder involvement at
11 the local level going forward in order to help answer
12 some of the questions about what is, you know, is this
13 okay what we're doing, and how should we do things
14 differently?

15 PROFESSOR GOULDER: So at this point, we've
16 gone through all the cards that have come in.

17 I just want to make one quick comment, if I
18 may, about uncertainty and modeling.

19 I think we focused a lot on the limitations and
20 the blemishes in these models. My view is that there
21 still is a lot of information that comes out of them.

22 For one, in calibrating the models and trying
23 to build in the behavioral parameters, building the
24 data, there is a lot of information that goes into that.
25 It's not entirely arbitrary.

1 There is uncertainty, but there's a lot that
2 goes into the model that's based on good empirical
3 evidence and good research.

4 Yes, the models differ, and there's also a lot
5 of range of uncertainty about parameters.

6 There as Tom Tanton indicates, we can deal with
7 that -- a highfalutin way of dealing with that would be
8 through a Monte Carlo approach where you just randomly
9 let all the parameters vary according to some
10 distribution.

11 But I think that the ARB and Charles River have
12 already done a lot in that spirit, which is to do fairly
13 broad sensitivity analysis.

14 One thing that I take from it is that even if
15 you look at the range of results under these range of
16 scenarios, they are not all that far apart. So I think
17 that helps build confidence.

18 So I guess this is more of my own personal view
19 that we should feel at the end of the day that we're
20 getting some useful information out of these models,
21 that the uncertainty shouldn't be so daunting as to make
22 us throw up our hands and say we haven't learned
23 anything.

24 But that's a personal view.

25 CHAIRPERSON NICHOLS: All right. I think I've

1 seen quite a few cards making their way to the floor of
2 people who want to stand up and have their few minutes
3 at the microphone here. Okay.

4 So I don't need this list printed out unless
5 you need to. Just bring me the cards, and we'll call on
6 folks.

7 DR. KEVIN KENNEDY: Actually, I think there may
8 be one or two questions we --

9 CHAIRPERSON NICHOLS: Okay. Why don't you go
10 ahead.

11 DR. KEVIN KENNEDY: I'll go ahead, and -- one
12 from Dorothy Rothrock from CMTA regarding tracking
13 leakage going forward.

14 Will we be doing this? And also wants everyone
15 to know she has a slide to share that shows site
16 selection in California already.

17 DR. ROLAND-HOLST: Is that a question to Reid?

18 MR. HARVEY: It's directed at me, I guess, or
19 is it directed at California? That's the question.

20 DR. KEVIN KENNEDY: Was it -- anyone can take
21 it. We were trying to do some initial sorting of who we
22 thought the questions were most appropriately directed
23 to.

24 MR. HARVEY: I'll take a stab from the national
25 level and see if that's sufficient.

1 So at the national level, we have substantial
2 trade data that we collect already through the economic
3 census. EAA collects data. We use those data in the
4 report that I mentioned that we released back in
5 December.

6 If I can, I'd just like to restate the bottom
7 line of that report which was that we found very little
8 initial leakage to other countries that were not taking
9 on caps that were about ten million tons a year, that
10 the vast majority of emissions reductions achieved by
11 energy-intensive industry under the Cap and Trade
12 program are from reductions in the emissions intensity
13 of production as opposed to things like increased energy
14 efficiency, as opposed to decline in production, such as
15 increased imports from unregulated countries.

16 Nonetheless, I think we have a good body of
17 data already to understand trade and emissions.

18 If there is national legislation passed, we
19 would have additional authority to do this because there
20 would be an output-based allocation system that would
21 require that we implement this allocation system based
22 on very detailed data from these firms.

23 So that -- that's the national perspective.

24 CHAIRPERSON NICHOLS: I have a slightly
25 different question if I may build on your question. Do

1 you mind?

2 Several years ago, there was a report that was
3 done by a commission in Great Britain that was under the
4 name of Sir Nicholas Stern in which he argued, and I
5 heard a presentation on this, that failure to deal with
6 climate change was going to lead to another kind of
7 disastrous global economic impact which was that people
8 in those poor parts of the world who are in theory at
9 least in the future going to be the market for all the
10 things that we are going to be producing, whether it's
11 food or cellphones or whatever, would now be homeless
12 refugees or, you know, you can paint out the scenario.
13 For some of these countries, it's really terrible.

14 And therefore that the global economy as a
15 whole was going to suffer, including wealthy nations
16 which would suffer because of their inability to export
17 to these places.

18 And I think that report was widely criticized,
19 and it was -- I don't know if it's still considered
20 valid or not.

21 But that particular issue just seems to have
22 kind of disappeared. So we're not just talking about
23 whether California or the US alone, you know, could do
24 okay if we start limiting our emissions.

25 This is sort of a different question that

1 assuming that the world is going to be going through
2 changes that are already underway, to what extent is
3 that going to also be having an effect that we should be
4 building into our model?

5 MR. HARVEY: That's right. We have an
6 interconnected global economy, and the health of our
7 trading partners has an effect on us as well. And so
8 the impacts of climate change on our trading partners
9 will certainly have an effect on us as well.

10 DR. HANEMANN: I was in a conference yesterday
11 with a good friend of mine, Dale Whittington, from North
12 Carolina who is working as part of a group to try and
13 sort out the Indus River system and the Ganges Basin
14 Plain is one of those areas, I think five hundred
15 million people, and significant risks of flooding in the
16 event of climate change.

17 And so, you know, when people talking about
18 water wars in the future and immigration, whatever, in
19 many areas that's sort of exaggerated.

20 But there are vulnerable areas, and that's one
21 and not the only one. But that's a real issue depending
22 on how quickly you get climate change and how severe the
23 effects are.

24 So it's an -- it's a real issue.

25 CHAIRPERSON NICHOLS: The reverse of

1 competitiveness.

2 DR. HANEMANN: The good news is instead of
3 making the cellphones, they'll be on our doorstep.

4 PROFESSOR GOULDER: I think this actually --

5 MR. TANTON: Chairman Nichols, if I could add a
6 little bit to that.

7 CHAIRPERSON NICHOLS: Sure.

8 MR. TANTON: It is crucial that we keep the
9 rest of the world in mind. We often hear, you know, the
10 United States has five percent of the population and
11 20 percent of the emissions.

12 That's true.

13 But we're also responsible for 30 percent of
14 the world's GDP. We're feeding them. We're giving them
15 cellphones. All this other stuff.

16 We heard earlier about our emissions intensity.
17 Our emissions intensity had been on a three-decade
18 improvement. We're getting better at feeding and
19 clothing the rest of the world, and we need to bring
20 them up to our standard.

21 CHAIRPERSON NICHOLS: I understand.

22 PROFESSOR GOULDER: I think this connects with
23 possible ways that ARB moving forward can improve its
24 modeling.

25 We mentioned how the model is California

1 oriented, doesn't deal with leakage.

2 But this offers a second reason which is that
3 to the extent that California takes action, it avoids
4 damages elsewhere and avoids reverberation of costs to
5 California.

6 So I would hope that over time the ARB can
7 expand its analysis. Now going all the way to a global
8 model may be overly ambitious, but at least bringing in
9 a little bit more regional detail beyond California
10 might be a good investment.

11 DR. ROLAND-HOLST: Let me just follow up with a
12 question I'd like to pose to basically -- I guess I
13 would pose it to the Board.

14 And that is: Beyond the mitigation agenda, as
15 we call it, which is dealing with emissions and
16 greenhouse gases, there is a looming and vast agenda
17 which Chairman Nichols has referred to which is the
18 adaptation agenda.

19 California cannot stop climate change alone,
20 but we have responsibility to protect ourselves against
21 its consequences.

22 And I've been involved in studies of those
23 impacts. You've been involved in big studies of those
24 impacts.

25 And believe me, we're not talking about our

1 great-grandchildren's life experiences. This will
2 happen in a matter of a few decades. We'll begin to see
3 this.

4 But we're fortunate in California because in
5 poor countries' climate adaptation will be about
6 protecting people. In the wealthier economies, it will
7 be about protecting assets.

8 Because we have the resources to adapt, all we
9 need is the foresight to do so. And I would liken it to
10 trying to steer a supertanker to avert a distant
11 collision.

12 If we start now, this will be something that we
13 can probably come to terms with.

14 But we've got to begin to take action because
15 these are infrastructure decisions that have lives of 50
16 to 100 years.

17 And in my talking around the state about these
18 issues, I have one frustration I think, and that is that
19 people haven't internalized this risk the way they have
20 internalized a seismic risk.

21 That's something we get gentle reminders of in
22 the west coast in the middle of the night a few times a
23 year. For that reason, we're building a new bridge in
24 the San Francisco Bay before the other one falls down
25 because we know that risk is real.

1 Now we acknowledge that.

2 I'm very concerned that the state really needs
3 to begin to look towards that horizon and think about
4 the adaptation challenge in a way that begins to use
5 very large recurrent budgets for infrastructure in a way
6 that can help minimize the long-term costs.

7 CHAIRPERSON NICHOLS: Good point.

8 There is a blue ribbon commission under way
9 that's working in parallel with the state's climate
10 action team that's collective bargaining agreement
11 action team that is at least coming up with an
12 assessment of this problem.

13 I think it's directed at coming up with a
14 report by the end of the year to recommend specific
15 policies for legislation and for the next administration
16 for just the reasons that you're saying.

17 Because even in bad times, we are spending
18 money on infrastructure but we're not necessarily
19 spending it with climate in mind, and that's definitely
20 something that has to be corrected.

21 Okay. Are you done or do you still have
22 further --

23 DR. KEVIN KENNEDY: I think there's just one
24 more from the cards we collected.

25 This was from Obadiah Bartholomy from the

1 Sacramento Municipal Utility District:

2 Assuming that out-of-state reductions
3 whether in the form of offsets or
4 allowances are less expensive but return
5 limited value to California, how much
6 more could we justify spending for in
7 state reductions given the value would
8 flow back into the state's economy?

9 And I'm guessing there's not a short answer to
10 this question. But I think it's useful to sort of see
11 if there's any short initial responses from any of the
12 economists.

13 DR. BERNSTEIN: Can you say the question one
14 more time?

15 DR. KEVIN KENNEDY: The basic idea as I'm
16 understanding it may be -- you may be able to find less
17 expensive reductions out of state, but the money flows
18 out of the state.

19 When you're paying for the reductions in state,
20 the money stays, so how much more can you justify
21 essentially spending the money in state in order to get
22 the reductions and keep the value within California?

23 PROFESSOR GOULDER: Well, there's such a thing
24 as balance of trade and -- or balance of payments. And
25 it's the old mercantilist idea which has been debunked

1 by economists that says that spending in state is
2 necessarily better than spending it out of state.

3 Money spent out of state become income to out
4 of state residents which ultimately flows back to
5 California.

6 So I would question the premise of it.

7 Now that doesn't mean that offsets or out of
8 state options are all going to be good. But if they are
9 real good, I think we shouldn't worry about them simply
10 because it's a flow in one direction out of the state
11 because that's going to be compensated by a reverse flow
12 from out of state.

13 BOARD MEMBER TELLES: Could you explain how
14 that revenue will return to California? Especially if
15 we have products which are more expensive? Who is going
16 to want to buy them? A simple way of looking at it.

17 DR. BERNSTEIN: I think that's almost to
18 Larry's points, right? That by taking advantage of
19 these out of state offsets, the price of California
20 goods will not rise as far. So you'll lose less is one
21 avenue, also you lose less.

22 BOARD MEMBER TELLES: That's predicated on the
23 fact that the rest of the country is doing the same
24 thing. But if we're doing this and only doing this, I
25 can't see how our cost won't be --

1 DR. BERNSTEIN: I'm sorry. I'm talking about
2 if you take the situation that the person with the
3 question brought up, you have the situation, one, where
4 you only purchase in-state offsets, and so you'll have a
5 permit price of let's say \$50.

6 If you're allowed to purchase them out of
7 state, you'll have a permit price of \$25.

8 BOARD MEMBER TELLES: I understand what you're
9 saying. I'm saying if only California does this, we
10 have a price, a negative price --

11 DR. BERNSTEIN: But you'll have less of a
12 negative price.

13 BOARD MEMBER TELLES: I know, but you'll still
14 have a negative price. And how are you going to get the
15 money back? And why would they buy California products
16 when the products from California, because nobody else
17 is going to be doing this, is more expensive?

18 PROFESSOR GOULDER: For the same reason that
19 there's a balance of payments identity at the global
20 level. It also applies in California versus the rest of
21 world.

22 It's a little hard to do without graphs and
23 things like that.

24 But how about this. Suppose that California is
25 producing \$100 billion worth of goods, and it's all part

1 of income in California, so that's value of the goods
2 and value of the income.

3 Suppose the rest of the world's also doing a
4 hundred billion.

5 But now California wants to take some of its
6 hundred billion income and purchase goods out of state.

7 There's still only a hundred billion of goods
8 produced out of state, so adjustments are going to be
9 made so they're going to now shift their consumption
10 toward California's hundred billion.

11 Sometimes the overall income and the
12 orientation of consumption has to match where the
13 production occurs. So it has to come back to
14 California.

15 BOARD MEMBER TELLES: If I was out of state, I
16 would say thank you and then I would spend my money
17 someplace else where I could get a cheaper product.

18 PROFESSOR GOULDER: Okay. Well, we'll have to
19 leave it at that.

20 DR. ROLAND-HOLST: Could I jump in just a
21 little bit. I'm not going to try to decide this issue.
22 And in fact, I think that the question actually raises a
23 very interesting agenda for trying to assess the net
24 benefits of offsets.

25 There are two aspects of offsets that I just

1 want to mention because I'm not exactly a fan of
2 offsets. If California participated in a national
3 program, I'd be very congenial to that.

4 But otherwise, I see offsets as a way of
5 denying California its own invention potential. You
6 want to outsource efficiency gains to China?

7 I mean let's subsidize the China to invent
8 these technologies? Why would we want to do that?

9 On a purely finance basis, yes, it would be
10 cheaper to reduce carbon pollution in China than it
11 would be in California. But we would be essentially
12 providing incentives for the Chinese to develop
13 technologies that we might ourselves like to develop.

14 So we need to think about these issues.

15 I agree that mercantilism doesn't work in the
16 aggregate, but there are these aspects of investment in
17 innovation, not outsourcing pollution.

18 And the second dimension of offsets I'm worried
19 about is local pollution. Criteria pollutants.

20 We're going to do less mitigation in
21 California. That will -- may not have a net effect on
22 greenhouse gases, but it will mean more local pollution
23 in California for sure.

24 CHAIRPERSON NICHOLS: Okay. I have a few cards
25 here. People who also want to stand up and speak, or

1 at least said they did at one time. You don't have to
2 if you don't want to.

3 We would like to hear from you. We really
4 would. Jim Lazar from Burbank Water and Power.

5 MR. LAZAR: Good evening, Madam Chair and
6 Members. My name is Jim Lazar. I'm an economist and
7 consultant to Burbank Water and Power.

8 I had actually asked to be a panelist and have
9 followed almost everything that's been said today; but
10 given the time limits, I'll confine myself to two narrow
11 issues.

12 First, the economic analysis does not have any
13 regional analysis. Given that the conclusion is that
14 there's essentially a zero net impact, there are going
15 to be regions that are winners and regions that are
16 losers.

17 My hypothesis is that urban regions will do
18 better than rural regions and that northern California
19 will do better than southern California.

20 But actually, answering that question involves
21 more than just a hypothesis, and I think it would be
22 useful for the State to have some regional analysis.

23 The second topic I to want address is one that
24 Dr. Sperling raised in his questions to Dave and Paul
25 regarding complementary measures.

1 The economic analysis bundles together some
2 complementary measures that are required by existing law
3 other than AB 32 with those that are not a factor or
4 part of the Scoping Plan and would be required as a
5 result of adoption of the Scoping Plan as it's now
6 drafted.

7 On page 2 of my written comments, table 1, I
8 have a table called Cost Effectiveness of Complementary
9 Policies, and I've taken seven categories that were --
10 six categories that are listed there.

11 And I added the annualized capital costs to the
12 annualized fuel savings or costs and come up with the
13 sum of annual costs, divided those by the tons of
14 emissions reduction to get an index of relative cost
15 effectiveness.

16 And this is a pretty simple and crude tool, but
17 there are some that have negative costs and some that
18 have positive costs.

19 Those that have negative costs, I think Dr.
20 Roland-Holst and Dr. Bernstein would agree if a
21 complementary policy mandate accelerated those and
22 pushed past market barriers to achieve greater
23 achievement of those, it would be beneficial to the
24 economy.

25 And similarly, I think they would both agree

1 that if complementary policies mandate, require things
2 that are more expensive, it might not have such a
3 positive impact on the economy.

4 So in table 2, I actually bundled these into
5 those that are required by other laws, specifically
6 AB 2021 which mandates the energy efficiency investment
7 and Senate Bill 375 which directs the VMT reduction
8 measures, as those will happen with or without AB 32.

9 And those have together an annualized benefit
10 to the economy of over \$12 billion a year based on the
11 numbers that are in the revised economic analysis.

12 I have then bundled together the other measures
13 that would be imposed by the Scoping Plan and if AB 32
14 were suspended by the voters, by the governor, by the
15 courts, would not be in effect. And those taken
16 together have a negative impact.

17 I would urge the Board to make one fundamental
18 change here which is to require that those measures that
19 are required by AB 2021 and SB 375 be moved out of the
20 implementation cases where they are now and into the
21 reference case because if the Scoping Plan doesn't go
22 forward they are scheduled to happen anyway, and they
23 belong in which reference case.

24 I would also urge ARB to direct the staff to
25 perform some regional analysis of some kind.

1 CHAIRPERSON NICHOLS: Thank you. Norman
2 Pedersen, and Obadiah Bartholomy.

3 MR. PEDERSEN: Good evening, Chairman Nichols.
4 I am Norman Pedersen for Southern California Public
5 Power Authority.

6 CRA has said there a cost to complementary
7 measures as opposed to the pure Cap and Trade approach.
8 We actually question CRA's calculation of some of the
9 cost of -- some of the measures they talked about.

10 I think I had heard Mr. Bernstein say today for
11 example that the cost of alternative fuels under LCFS
12 would be 2.5 times the cost of conventional fuels.

13 That isn't in his written materials, but we
14 question that being aware of what the ARB staff has said
15 on that point.

16 Nevertheless, beyond that, we are willing to
17 say there is a cost to some complementary measures, and
18 that the cost will be high, and that it will be a
19 societal cost.

20 We are very familiar with the sort of marginal
21 abatement curves that Professor Nelson showed you today.

22 Some of the measures that the electric utility
23 sector will be pursuing are going to be very high on
24 that marginal abatement curve.

25 In the 33 percent RES proceeding you have

1 underway, ICF is projecting that by 2020 the RES cost
2 will be approximately \$3.5 billion a year and raise
3 electric rates by about 7.5 percent.

4 Nevertheless, SCPPA supports the complementary
5 measures like RES and we support them for a host of
6 policy reasons.

7 Our proposal is not to do away with
8 complementary measures. Our proposal is that allowances
9 be administratively allocated to the electric utility
10 sector and to the utilities in the sector for the
11 benefit of electricity consumers to offset the impact of
12 the cost of the complementary measures on ratepayers.

13 Our proposal is not to abandon the
14 complementary measures.

15 And one last point that more favorably
16 impressed us in CRA's presentation is the point that the
17 four percent offset limit in the Scoping Plan could
18 reduce allowance prices by 33 percent.

19 Now it seems that there is something of a rule
20 of diminishing returns. And this is actually the point
21 of my question to you, Mr. Bernstein. There's a point
22 of diminishing returns with offsets.

23 For example, CRA projects that if you increase
24 the use of offsets at the much higher level that would
25 be allowed under Waxman-Markey, you'd only get another

1 33 percent in allowance prices, so it does seem there's
2 diminishing returns there.

3 Nevertheless, we support Mr. Tanton's concept
4 of the price collar, and we support increasing the limit
5 of on use of offsets as way to contain allowance prices
6 if the high end of that price collar were hit while
7 still retaining the integrity of the Cap and Trade cap.

8 Thank you very much for this opportunity to
9 address you this evening.

10 CHAIRPERSON NICHOLS: Thank you.

11 Okay. Obadiah.

12 MR. BARTHOLOMY: Quite a lot of beeping and
13 whining going on with the electronics here today. Okay.

14 Good afternoon, Chair Nichols and fellow
15 Members of the Board and all of our wonderful ARB staff
16 and economists who contributed today.

17 SMUD really appreciates the good hard work
18 that's been done in thinking about how the AB 32 program
19 is going to impact the state's economy, and we certainly
20 support the State's investment in moving to a lower
21 carbon economy and believe it will result in having good
22 green jobs come here to California.

23 We have a couple of thoughts.

24 There was a lot of discussion on complementary
25 measures today. And while we agree with Norm that some

1 of those are going to be expensive and some inexpensive,
2 like Norm and SCPPA, we strongly support including of
3 complementary measures for a couple of reasons.

4 There was a lot of discussion of market
5 barriers for energy efficiency in particular, and we
6 fully agree that while we'd love it if our customers
7 would just see the cost logic and adopt energy
8 efficiency measures, it actually takes a lot of hard
9 work to get them to do that, and strong programs that
10 we've been developing over the past 30 years.

11 Another reason that we strongly support
12 complementary measures is because we recognize that
13 we're not stopping at 2020.

14 It would be great if we could just design a low
15 cost system to get to 2020, 15 percent reduction, and
16 stop there.

17 But if you actually look at getting to 2050,
18 we're going to need to ramp up programs in renewable
19 energy technologies, renewable fuels, all those things
20 to get to those deeper reductions that we're going to
21 need to hit.

22 With respect to use of allowances revenue, SMUD
23 agrees in general for the electric sector but really for
24 all sectors that it's essential to invest revenues
25 raised from auction into measures that actually reduce

1 emissions and contribute to the goals of AB 32 and help
2 us to actually create green jobs in the economy.

3 As far as the offsets question goes, I think we
4 would agree on the specific looking at the use of
5 expanding offsets in the event that you're hitting the
6 upper end of your cost target range and making sure that
7 you're not penalizing the state's economy too much but
8 also maintaining the environmental integrity of the cap
9 overall through the use of environmentally sound
10 offsets.

11 Lastly, SMUD believes that the economic
12 analysis of AB 32 would be enhanced with a look at a
13 couple of different policies scenarios.

14 And specifically, those scenarios could examine
15 costs and benefits associated with higher fuel costs
16 than were in the baseline forecast similar to the costs
17 that the world experienced just a short two years ago.

18 Finally, we strongly agree with the idea of
19 incorporating technology innovation into scenario
20 analysis to understand what the benefits could be to the
21 state. Thank you.

22 CHAIRPERSON NICHOLS: Thank you. Hank Ryan?
23 Then Dorothy Rothrock.

24 MR. RYAN: Hello. My name is Hank Ryan. I'm
25 Executive Director for Small Business California.

1 Appreciate the opportunity to speak in front of CARB and
2 this panel.

3 And first of all, we just want to say that very
4 much appreciate this appendix that just came out. It
5 happens to clarify the balance of all the different
6 studies out there.

7 In fact, as much work as I know it has been, it
8 would seem to be productive to have this perhaps happen
9 again because things will continue to change and build
10 out. It just seems very informative and helpful.

11 Briefly, I just want to mention something that
12 Chris initially talked about on bill financing and how
13 it can effect all cost effective energy efficiency which
14 is indeed the loading word.

15 San Diego Gas & Electric's program essentially
16 has grown by leaps and bounds and is retaining a one
17 percent -- less than one percent default rate. And
18 that's being followed by the other utilities here in
19 California.

20 Because it addresses all incentives that they
21 provide, it is going to be able to reach far deeper into
22 what is going to be the affordable cost effective energy
23 efficiency out there.

24 We are constrained by access to capital in a
25 huge manner. So on bill financing and property tax

1 assessment approach for financing I think will really
2 allow us to expand out. We need that very much.

3 And again, this access to capital framework
4 that we're looking at from small business right now is a
5 real problem.

6 One thing that was mentioned today had to do
7 with we will be smarter tomorrow than we are today.

8 And I think we'd all like to believe that, but
9 one thing that was in this appendix was very important
10 for us to read, and that was the reference to the
11 Varshney study.

12 Because as small business is represented by a
13 variety of entities around the state, one of those
14 entities is the Governor's Small Business Advocate.

15 And that study is the only study that is on the
16 website for small business to access. And we believe
17 that that's a real serious problem and goes directly to
18 the issues of communication and, frankly, fear mongering
19 that does not help us.

20 We will not go to invest in efficiency if we're
21 scared. We need to be informed.

22 So I have asked in writing for that to be taken
23 down or to be matched by complementing studies at the
24 very least. I hope to have a dialogue with the
25 advocate, Small Business Advocate, shortly that will

1 help that -- perhaps that dialogue continue so that
2 something can happen to that effect, and I just want to
3 make that statement on the record.

4 Thank you.

5 CHAIRPERSON NICHOLS: Thank you for your
6 interesting point. Ms. Rothrock and then Ray Williams.

7 MS. ROTHROCK: Dorothy Rothrock, California
8 Manufacturers & Technology Association.

9 I'd like to say that we're very concerned and
10 hope that innovation is going to drive job growth and
11 economic success in California; and we're concerned that
12 in fact it won't, at least so far as manufacturing is
13 concerned because of what we're seeing happening in the
14 economy.

15 And we're wondering about the Business-as-Usual
16 sort of assumptions we may be making.

17 I've handed out a chart that shows what we're
18 seeing actually on the ground. This isn't a model.
19 This is what Site Selection Magazine has found with
20 regard to where people are siting or expanding
21 manufacturing capacity.

22 And as you see, of the 25 most populous states,
23 we're way down on the list in terms of new or expanding
24 facilities per one million people.

25 If you look up above, you'll see that while we

1 now have 11.7 percent of the US manufacturing workforce,
2 we've only sited 1.5 percent of the new or expanded
3 facilities in this state.

4 So with increasing costs associated with
5 AB 32 -- and we understand that you're going to try to
6 minimize the impact on trade-exposed industries
7 including manufacturing hopefully, right now the leakage
8 is happening, even before AB 32 really goes into effect.

9 We've got energy prices in the region that are
10 far lower than ours. We're at about 9.5 cents per
11 kilowatt hour for industry, and other states in the west
12 are anywhere between 4.5 to 7 cents per kilowatt hour.

13 So if we're allowing -- it's a little bit like
14 the skids are greased on leakage. And we're not going
15 to get innovation in California. We're simply going to
16 get the expansion happening elsewhere.

17 So where is the innovation going to happen in
18 terms of at least manufacturing capacity? It's not
19 going to happen in California. It may happen somewhere
20 else because we're -- somebody's having to buy things.

21 But it won't be us. We'll just be moving
22 manufacturing somewhere else.

23 I don't have an answer to the problem, but I
24 really do want the innovation to happen here, and I want
25 it to be manufacturing.

1 Thank you.

2 DR. BUSCH: Could I ask, Dorothy: Do you have
3 a sense like -- I mean you use site as a sort of
4 assuming capacity is equal across sites, but is there --
5 do you have a sense of whether there's essentially the
6 same -- is there any variation in size? Because you
7 could have a hundred small sites that would be less
8 capacity than one big site.

9 MS. ROTHROCK: I've thought about that.

10 The Site Selection Magazine survey didn't
11 include a reference on the size of these expansions, but
12 I heard from the NFIB yesterday that California really
13 is a small business state.

14 So in a sense, you might assume that these are
15 probably relatively small expansions because we have so
16 much small business in the state. I guess 90 percent of
17 the business entities in the state are small, whereas
18 50 percent of the employment is small business.

19 CHAIRPERSON NICHOLS: Ray?

20 BOARD MEMBER ROBERTS: Can I interrupt here
21 because there's something I think is being missed here.
22 I think she's hit on it, and it started to come up
23 earlier.

24 If you look, once -- there's -- the world has
25 changed dramatically, and I think at least some of what

1 I've heard not is not reflective of that.

2 At one time I can tell you there were things
3 like research that was done in San Diego. I'm very
4 familiar with the research that was done, for instance,
5 on ballistic missiles. Not only was all the research
6 done, the production was done in San Diego.

7 That's not happening. And it's not happening
8 in California period.

9 Let me cite some recent examples.

10 I mean one that's clear, we have some of the
11 foremost companies in the world developing algae as a
12 fuel. The production facilities, even the research
13 production facilities, will not happen in California.

14 Why? Because it takes you about two years to
15 get a permit. It's not going to happen. It isn't
16 happening here.

17 Even the research production facilities are not
18 happening here.

19 There was once that I think we could count on
20 the innovative people here developing companies that was
21 going to lead to the production here.

22 That is being separated in a significant way
23 because of the obstacles to doing some of these things
24 in California.

25 And I think what I've heard out of a lot of

1 models, there is sort of this smugness that California
2 is going to be innovative, and all these benefits are
3 going to come to California because of this innovation.

4 I think that our innovative edge is being
5 competed over to a greater extent, and you mentioned all
6 the things you saw in China.

7 Even the innovation, if we make a new rule,
8 doesn't mean the innovation's going to be in California.
9 But the production and the jobs that you're talking
10 about are on anything of scale -- and by scale, I'm
11 not -- it doesn't have to be very large.

12 We're talking about research. A pond to grow
13 algae that was going to take over two years to get
14 permitted in San Diego -- in California; excuse me -- in
15 California.

16 We have some tremendous obstacles, and at the
17 same time we're saying we're going to create all these
18 opportunities.

19 Those opportunities are going to go elsewhere.

20 I couldn't disagree more when I'm hearing that
21 somehow that money's going to automatically flow back to
22 California. I think it's absolutely nonsensical.

23 We are creating a game that in prior years, and
24 maybe in prior decades, we would have had an edge. We
25 would have gotten direct benefits and they would have

1 been pretty significant.

2 I don't see it happening now.

3 And I think some of the questions that you're
4 suggesting and raising need to be looked at in a lot
5 more depth, because the world has changed dramatically.

6 California needs to really analyze its
7 position, and there's economics that go way beyond
8 anything I've heard today that are at work here that I
9 think suggest that any of these rules may be of benefit
10 and may be of benefit to the planet, but I don't think
11 they're going to be of benefit to California.

12 CHAIRPERSON NICHOLS: Mr. Williams.

13 MR. WILLIAMS: Thank you, Chairman Nichols and
14 Members of the Board. I admire you all for your staying
15 power. It's almost 6 o'clock, and you're still very
16 actively engaged. So thank you so much.

17 My name is Ray Williams from Pacific Gas &
18 Electric. I would just like to lend a perspective on
19 complementary measures and talk for a moment on a price
20 collar.

21 I'm not a PhD economist, although I did survive
22 a couple of Dr. Wyatt's classes at Stanford in energy
23 economic systems.

24 There are market failures. Dr. Goulder brought
25 up the renter issue. I know I went and bought a

1 refrigerator recently. It would have been better to get
2 more information on the cost savings than was available
3 when I made the purchase decision.

4 So you know, we know it's there. So what are
5 the benefits?

6 To summarize, they can effectively address
7 market failures where they occur. They can help bring
8 new technologies to market sooner and reduce emissions
9 sooner than without -- than -- if they're designed
10 correctly.

11 But what are the risks? If they're too
12 preventative, they can choose technologies which are
13 either too costly or just not effective in reducing
14 emissions.

15 Or they could become more costly. As we found
16 out today, your fuel prices are -- move in a different
17 direction than what we might anticipate.

18 So given that, I just wanted to suggest a
19 metric for looking at this.

20 If an allowance price is around \$20, let's say,
21 and let's say we have two or three years of experience,
22 and we look at these program measures and, you know,
23 they come in around the range of \$20 or less, then
24 you're probably on, you know, you're probably on the
25 right track. Maybe a little more, but moving in that

1 direction, probably on the right track in terms of
2 design.

3 But if that program measure is coming in around
4 \$100 a metric ton, and we're looking at substantial
5 capital commitments coming in at that time, I think we
6 need to take a closer look at it and, you know, that
7 five-year look in 2012 and 2013 is probably a good time
8 to take a look at that.

9 So just a metric that you might want to throw
10 out there to tie Cap and Trade and complementary
11 measures together.

12 CHAIRPERSON NICHOLS: Thank you.

13 MR. WILLIAMS: Then on the price collar.

14 The focus, the discourse is generally on the
15 high side, you know, focused on consumer protection and
16 doing it in a way where you still have integrity in the
17 way the cap works. That's very important.

18 But I also wanted to highlight the floor, a \$10
19 price. That floor price can encourage investment and
20 innovation into the market. It can be something that
21 can be very helpful.

22 So I just want to position the price collar as
23 kind of a balanced proposal which can help bring
24 innovation into the market as well as help with consumer
25 protection if you don't get the design of this quite

1 right, particularly in the first or second compliance
2 period.

3 Thank you.

4 CHAIRPERSON NICHOLS: Thank you.

5 The last person who submit a card is Hank
6 DeCarbonel. And then if the lights don't go out, we'll
7 have a few closing remarks.

8 These are set to go off at 6 o'clock, but we've
9 sent an emissary in the hopes they'll leave them on for
10 us for a while.

11 MR. DeCARBONEL: I just happened to see an
12 article today in the Financial Times of London regarding
13 the volcanic eruption in Iceland, a stationary source, I
14 suppose. It says:

15 Amid mounting pressure from airlines
16 which have been losing an estimated
17 \$200 million a day in revenue, European
18 Union transport ministers said they
19 planned to start opening air corridors to
20 bring home some of the hundreds of
21 thousands of people stranded by the
22 disruption.

23 Giovanni Bisignani --

24 If you know Mr. Bisignani, I apologize --

25 -- head of the International Air

1 Transport Association, said Europe had a
2 unique system for dealing with volcanic
3 eruptions based on theoretical models on
4 how far ash spreads. The chaos,
5 inconvenience, and economic losses are
6 not theoretical. They are enormous, he
7 said. We must make decisions based on
8 the real situation in the sky. Not on
9 theoretical models.

10 And I submit that's the problem. It's a
11 wonderful model, but what if somebody's wrong?

12 We have people standing at hearings in
13 Washington, DC right now. Smartest guys on Wall Street.
14 Smartest regulators and smartest politicians, and
15 they're all competing for how stupid. Each one is
16 dumber than the last.

17 But in the meantime, we've got an economic
18 collapse in this country, and these guys were all
19 participants. And suddenly, all they can say is they
20 were hornswoggled.

21 We've got to be very careful here when we start
22 making all these decision on models and theories and
23 what-ifs.

24 The 3M position is very moderate to me. I
25 think we've got to be very careful what we do and be

1 very ready to make some quick changes when things don't
2 turn out quite the way we planned.

3 Thank you.

4 CHAIRPERSON NICHOLS: Okay. That's closing
5 words of wisdom.

6 I think I will turn it back over to Larry
7 Goulder, if you have any closing remarks on behalf of
8 the panel. You want to defend the models?

9 (Laughter)

10 PROFESSOR GOULDER: No. I think that those
11 last comments were very important.

12 We have to be humble. I also feel though we
13 want to get all the information we can and make use of
14 it. That's where I think models can contribute.

15 But we'd be foolish to put more faith in them
16 than the models deserve.

17 I guess all I would say in closing is thank
18 you. I'm very -- I think it was a very good move. I
19 applaud the ARB for have this session to give the public
20 a chance to look at the differences and results, to
21 contemplate the differences and allow the modelers to
22 try to explain the sources of differences and the range
23 of uncertainties.

24 So I just want to thank you for letting us
25 participate.

1 CHAIRPERSON NICHOLS: Well, thank you.

2 I want to thank the staff who organized this,
3 Jan Mazurek, from my staff. Kevin Kennedy again was
4 sitting at the table. And of course David Kennedy who
5 actually had to do the modeling work here. He's looking
6 an awful lot more rested and dressed up, suited than
7 when I've seen him in recent days.

8 (Laughter)

9 CHAIRPERSON NICHOLS: Maybe he's had a little
10 time to relax before coming to the panel. I sure hope
11 so.

12 These are tough issues, and we're dealing with
13 them in tough times.

14 And I think the comments and questions coming
15 from all the Board Members indicate that we are very
16 mindful of the importance of what we're doing.

17 We have both the benefit and the honor of being
18 leaders in California because of our legislation and
19 because of our history, and a lot of confidence has been
20 placed in the Air Resources Board as the agency to do
21 some pretty critical planning and design work.

22 And we take those obligations very seriously,
23 and we are extremely grateful for the help that we've
24 received, most of it completely uncompensated, from the
25 people on this panel and others over the last years that

1 we've been working on this.

2 The next few months are obviously going to be
3 critical times as we try and get ready to come together
4 with the last pieces of our program proposals, including
5 the design of a comprehensive Cap and Trade program.

6 And this is something that obviously is getting
7 a lot of questioning. We are still hopeful. With every
8 passing day, we get a little less hopeful.

9 But I think there's still some serious movement
10 in Washington to put another bill forward in the senate
11 and possibly get to a national program. What it will
12 look like, we don't know.

13 But any decisive movement on the part of the
14 federal government to cap emissions at the national
15 level would be helpful.

16 We're also actively engaged in working with the
17 Western Climate Initiative. We've had both Mr. Kennedy
18 and Mr. Goldstene attending meetings with the seven
19 western states and three Canadian provinces, and they
20 are going through their own sets of upheavals in the
21 political arena.

22 And yet still, all of them are at the table
23 working on this issue because, wherever they come from
24 on the political spectrum, they are all facing the
25 recognition that energy independence, a shift to more

1 renewable forms of energy, are going to be critical to
2 our future if we can find ways to bring them on and to
3 go through a transition as painlessly as possible.

4 But transitions are always difficult. And so
5 our job is to try to make this one as beneficial as we
6 can and to recognize, as we said -- many people have
7 told us that we don't know everything today that we
8 would like to know.

9 And so we have to find ways of making progress
10 while at the same time allowing ourselves to make
11 corrections when we need to.

12 So this is an important fundamental piece of
13 the building blocks for what we're trying to do in
14 California.

15 All of the modeling work, and despite the
16 occasional jokes, and I may have said a thing or two at
17 times about economists that, you know, wouldn't be
18 entirely flattering. But the fact is --

19 (Laughter)

20 CHAIRPERSON NICHOLS: -- that we need you, and
21 we really do appreciate you, and we're going to take
22 advantages of you, what you've given us.

23 So thank you all very much.

24 BOARD MEMBER SPERLING: I'd like to follow up
25 on that, just a short comment, and that I also found

1 this tremendously valuable, the work of the committee.

2 Professor Goulder, I thought that report
3 summarizing and comparing the report was tremendously
4 value and useful to us.

5 And I think that an idea possibly as we go
6 forward is perhaps doing something like this again.
7 Chairman Nichols, are you listening?

8 (Laughter)

9 CHAIRPERSON NICHOLS: I'm listening. I'm being
10 reminded of all the people I should have thanked.

11 BOARD MEMBER SPERLING: So I'm actually even
12 taking it one step beyond that, and that is the idea of
13 looking at the policy design a little more.

14 You know, now that we have some comfort level
15 about the economics of, you know, the whole program, a
16 lot of the issues that came up here in terms of cost
17 containment and, you know, we talked about auctioning
18 offsets, these are very key design elements.

19 And I for one at least would like to see some
20 kind of forum, something like this with, you know, very
21 expert economists and others to be able to bounce some
22 of these ideas off and get some further input.

23 And I know Kevin Kennedy is doing a great job
24 doing this. Already he's reassured me on several
25 accounts.

1 But I think it would be a valuable activity and
2 exercise.

3 CHAIRPERSON NICHOLS: The staff has indicated
4 that they are going to be, now that we do have the EAAC
5 report and have gotten this forum under our belt, so to
6 speak, that they're going to be opening up a series of
7 workshops on design elements of the program.

8 And certainly Board Members are going to be
9 encouraged to attend as many of them as they can, as
10 well as stakeholders and other experts that we will
11 invite to come and join us.

12 So I did fail to mention in the course of
13 patting ARB on the head that we also have a very
14 important partnership within the administration with
15 Cal/EPA.

16 And they have been taking the lead, the Western
17 Climate Initiative active, and also providing us with
18 significant help along the way. So I did want to
19 acknowledge that and specifically thank Michael Gibbs
20 for his role in this.

21 Thanks, Michael.

22 And I have one other thing to say.

23 When we resume tomorrow morning in the Byron
24 Sher Auditorium, which is our usual home, at 9 a.m., and
25 the first item on the agenda is going to be a staff

1 update on the implementation of the Scoping Plan as well
2 as their outreach activities.

3 So this will be a further opportunity to
4 discuss their plans for next steps.

5 I think that's it. We are adjourned.

6 * * *

7 (Thereupon the AIR RESOURCES BOARD
8 hearing adjourned at 6:01 p.m.)

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1 CERTIFICATE OF REPORTER

2 I, LINDA KAY RIGEL, a Certified Shorthand
3 Reporter of the State of California, do hereby certify:

4 That I am a disinterested person herein; that
5 the foregoing AIR RESOURCES BOARD meeting was reported
6 in shorthand by me, Linda Kay Rigel, a Certified
7 Shorthand Reporter of the State of California, and
8 thereafter transcribed into typewriting.

9 I further certify that I am not of counsel or
10 attorney for any of the parties to said meeting nor in
11 any way interested in the outcome of said meeting.

12 IN WITNESS WHEREOF, I have hereunto set my hand
13 this May 7, 2010.

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